U.S. DEPARTMENT OF THE INTERIOR

OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

LIBRARY
OCT 12 1972
PACIFIC POWER & LIGHT
COMPANY

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 16
AUGUST 15, 1972

W72-09139 -- W72-09788

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription is $22 (domestic), $27.50 (foreign), single copy price $3. Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 16
AUGUST 15, 1972

W72-09139 -- W72-09788

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

PARTIAL PRESSURE OF GASES DISSOLVED AT GREAT DEPTH,
Rochester Univ., N.Y. Dept. of Physiology.
W. O. Fenn.
Science, Vol 176, No 4038, p 1011-1012, June 2, 1972. 2 fig, 1 tab, 3 ref.

Descriptors: *Gases, *Thermodynamics, *Aqueous solutions, Pressure head, Pressure measuring instruments, Laboratory tests, Oxygen, Carbon dioxide, Helium, Saturation, Oceans.
Identifiers: Dissolved gases, Teflon tube.

Earlier work by Enns and others on the effect of hydrostatic pressures on the partial pressure of O2 (Po2) in water is summarized. Techniques are described for measuring pressure of gases dissolved at great depths, as in the oceans. Thermodynamic considerations have been applied to data showing that the solubility of oxygen, carbon dioxide, and helium in water decreases with increasing pressure and depth. When water is saturated with a given gas at 1 atmosphere absolute, the equilibrium partial pressure of the gas at any depth is equal to the partial pressure of that gas if the gas is contained in a gas column extending from the surface to that particular depth. A graph shows the partial pressure of O2 which can be calculated for an O2-filled Teflon tube, as a function of altitude or depth. Values for gases in water for specific conditions are tabulated. (Lang-USGS)
W72-09537

02. WATER CYCLE

2A. General

HYDRO-PHYSIOGRAPHIC MODEL,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
For primary bibliographic entry see Field 06A.
W72-09234

AVAILABLE SOIL WATER: TIME-DISTRIBUTION IN A WARM SEASON RANGELAND,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
H. A. Schreiber, and N. G. Sutter.
Journal of Hydrology, Vol 15, No 4, p 285-300, April 1972. 3 fig, 3 tab, 6 ref.

Descriptors: *Available water, *Water balance, *Arizona, *Mathematical models, *Soil water, Water yield, Arid lands, Optimization, Computer programs, Correlation analysis, Time series analysis.
Identifiers: *Tombstone (Ariz).

A computer program estimates infiltration and subsequent evaporation using daily rainfall as input. The output predicts a predefined start of the growing season at Tombstone, Ariz., using official precipitation records from 1897 to 1970. Moisture sequences are predicted, assigning wet or dry status to the soil. The start of the growing season for perennial range grasses, defined as the presence of four consecutive days of wet soil, has occurred from June 8 to as late as early September, with a median start at July 14. The total number of wet days averaged 38 during the 4-month period of June to September. Every year had at least one period of drought within the growing season; drought periods occurred an average of 6 times and could exceed 12. The average maximum dry period was 18 days; the corresponding wet period was 21 days. The starting wet period averaged 13 days and the ensuing dry period was 5 days. The maximum wet period tended to occur earlier in the season than the dry. (Knapp-USGS)
W72-09271

HYDROLOGIC INVESTIGATION OF SMALL WATERSHEDS IN OHIO, PHASE I: 1966-1969,
Ohio State Univ., Columbus. Water Resources Center.
V. T. Ricca, and E. P. Taiganides.
Available from the National Technical Information Service as PB-209 928, $3.00 in paper copy, $0.95 in microfiche. Ohio Water Resources Center, Columbus, Project Completion Report W108, (1972). 69 p, 23 fig, 20 tab, 28 ref. OWRR B-005-OHIO (9) and B-019-OHIO (2).

Descriptors: *Agricultural watersheds, *Small watersheds, Demonstration watersheds, Runoff, Time of concentration, Corn belt, Appalachia, Hydrologic models, Computer models, Simulation, *Ohio, *Model studies, Land use, Strip mines, Water quality.
Identifiers: *Coshocton (Ohio).

Statistical, analytical techniques and deterministic models were used to study runoff phenomena from agricultural and strip-mined areas at the North Appalachia Experimental Watersheds Station near Coshocton, Ohio. Agricultural land use and surface strip mining were found to influence the runoff water. Peak runoff rates were predicted using the standard formulas and with the Stanford and Purdue computer models. The latter were modified and input parameters had to be developed before using them. A basic study was made to understand the fundamental phenomena and the mechanics of runoff. Small watersheds were defined as watersheds whose hydrology is modified with agricultural and industrial practices on the land during a year's time.
W72-09296

GREAT LAKES HYDROLOGY BY MONTHS, 1946-1965,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 02H.
W72-09298

WATER SUPPLIES AND THE LAND--THE ELKHORN RIVER BASIN OF NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 07C.
W72-09557

ECOLOGICAL DYNAMICS OF WATERSHEDS,
Washington Univ., Seattle. Center for Quantitative Science in Forestry, Fisheries and Wildlife.
S. Olsen, and D. G. Chapman.
BioScience, Vol. 22, No. 3, p 158-161, March 1972. 1 fig, 1 tab, 24 ref.

Descriptors: *Watersheds, *Model studies, Ecosystems, *Trophic levels, Energy, Energy conversion, Nutrient cycling, Hydrologic models, Water utilization, Recycling, Demonstration watersheds, Food chains, Hydrologic cycle, Hydrologic data, Herbivores, Carnivores, Primary productivity, Biomass, Chemical elements, *Washington.
Identifiers: Energy flow, *Fern Lake (Wash).

An attempt is made to provide a clear picture of energy, water, and element pathways through an ecosystem, the abiotic as well as biotic segments, and thus define the basis for a comprehensive survey of variables and causal pathways. The watershed is taken as the best example of a complete ecosystem, containing both terrestrial and aquatic parts with their populations of producers, consumers and decomposers. Definition and explanations of the ecosystem, watershed, and energy flow are correlated to a symbolic model used to represent water cycling dynamics. Primary and secondary trophic energy flows are included in the transfer function model of the water regime within a watershed. The element cycle pathways are considered to be about the same as water or energy pathways. The model represents the first step towards development of quantitative, mathematical models descriptive of complicated interactions between biota and their environments. It was planned for specific treatment of data from the Fern Lake watershed studies by Donaldson (1959) and Olsen (1967) but can be used for any ecosystem containing aquatic and terrestrial parts. (Mackan-Battelle)
W72-09565

ANNOTATED BIBLIOGRAPHY OF PUBLICATIONS ON WATERSHED MANAGEMENT BY THE SOUTHEASTERN FOREST EXPERIMENT STATION, 1928-1970,
Forest Service (USDA) , Asheville, N.C. Southeastern Forest Experiment Station.
For primary bibliographic entry see Field 03B.
W72-09603

2B. Precipitation

STRUCTURE AND MODIFICATION OF CLOUDS AND FOGS,
State Univ. of New York, Albany. Research Foundation.
B. Vonnegut, D. C. Blanchard, and R. A. Cudney.
Available from NTIS, Springfield, Va. 22151. AD-734 063 - Price $3.00 paper copy; $0.95 microfiche. Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, October 1970. 207 p. Annual Summary Report No. 3. AFCRL F 19628-68-C-0057.

Descriptors: *Drops (Fluids), *Raindrops, *Cloud physics, *Rainfall, *Electrical studies, Precipitation (Atmospheric), Rain, Hail, Lightning, Freezing, Particle size, Meteorology, Climatology, Storm structure, Thunderstorms, Instrumentation, Data collections.
Identifiers: Electrical studies (Atmospheric).

Electric field-water droplet interaction may offer a mechanism for the rain gush. Charge separation by precipitation and the production of aerosols from charged electrodes at potentials below breakdown were also investigated. Research into electrical tornado mechanisms and the field study of point discharge current are described. Studies on water-to-air transfer of bacteria reveal that bacteria concentrations in ejected droplets may be of one to three orders of magnitude greater than concentrations in the parent solutions. Experimental studies of droplet breakup, freezing, and wake effect were carried out. A new model of hail growth does not require wind shear to maintain the hailstone aloft for extended periods of time. A cloud model was tested to ascertain the feasibility of extensive cloud production by silver iodide seeding. A large vertical wind tunnel was further refined, and the dropsonde, intended to obtain drop size and concentration spectra, was field tested, as well as an ice-crystal detector for aircraft use. An optical lightning detector was developed. (See W72-09202 thru W72-09221) (Knapp-USGS)
W72-09201

EXPERIMENTS ON THE GENERATION OF RAINDROP-SIZE DISTRIBUTIONS BY DROP BREAKUP,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
D. C. Blanchard, and A. T. Spencer.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 3-10, October 1970. 9 fig, 23 ref. (Reprint from Journal of Atmospheric Sciences, Vol 27, No 1, p 101-108, January 1970).

Descriptors: *Raindrops, *Particle size, *Rainfall, Rainfall simulators, Laboratory tests, Cloud physics, Atmospheric physics, Distribution patterns.
Identifiers: *Raindrop breakup.

An artificial rain column was generated by letting a continuous stream of water fall under zero pressure from an open hose. Within a meter of fall the

stream broke into large drops. These large drops further subdivided, and interaction between the drops was noted during the remaining 60 m of fall. At the bottom of the rain column drop-size distributions were measured at intensities that ranged from 190-1900 mm per hr. Over this range the largest drops were about 9 mm in diameter, and the number of these drops per cubic meter was constant. For smaller drops, however, the concentration increased with intensity. Drops larger than 5 mm are unstable. In heavy rain the shape of the drop-size distribution is determined by drop collisions and breakup. (See also W72-09203) (Knapp-USGS)
W72-09203

EXPERIMENTAL STUDIES OF FREEZING, WAKE EFFECT, AND BREAKUP OF FREELY SUSPENDED SUPERCOOLED WATER DROPS,
State Univ. of New York, Albany.
J. D. Spengler, and N. R. Gokhale.

Descriptors: *Freezing, *Cloud physics, *Raindrops, *Particle size, Hail, Sleet, Rainfall, Ice, Precipitation (Atmospheric), Laboratory tests, Meteorology.
Identifiers: Wind tunnel tests.

A large vertical wind tunnel was used to suspend 2mm to 5mm water drops. The freezing and interaction of these suspended drops were studied at ambient air temperatures from +3 deg C to -27 deg C. Upon slow freezing in the temperature range 0 to -5 deg C, an ice shell forms around a drop. Starting with a frozen disc on the bottom of a drop an ice layer slowly envelops the entire drop. These ice-liquid drops may encounter heavy turbulence such as the wake of another drop and shed the liquid portion. This results in an ice disc which accelerates upward in a zig-zagging manner. At temperatures between -5 and -10 deg C drops can obtain a frozen shell of clear ice which completely encloses a liquid center. Rapid freezing occurring at temperatures colder than -10 deg C results in opaque ice pellets. Nucleation by sand, clay, dust or ice crystals produces opaque ice pellets at temperatures as warm as -5 deg C. At -2 deg C ice crystals were 100% effective as nuclei in freezing the drops. At -0.5 deg C ice crystals had a 50% efficiency. Ice pellets may increase in mass by accretion of ice crystals. During wake interactions drops which were brought into contact exhibited three distinct types of behavior. Coalescence occurred in 33% of the wake collisions. For 20% of the collisions the drops bounced off each other, 44% resulted in breakup. For 50% of the wake breakups, the drops pulled out a filament producing several small droplets while maintaining most of their original mass. Smaller drops in the size range 500 microns to 1.5mm striking a 5mm drop near the edge pull out a filament of very small droplets while decreasing only slightly in their velocity. Imactions near the stagnation point of a 5mm drop produce a crown-like splash pattern with the points of the crown breaking into smaller droplets. (See also W72-09201) (Knapp-USGS)
W72-09204

THEORY OF HAIL GROWTH,
State Univ. of New York, Albany.
N. R. Gokhale, and K. M. Rao.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 13-38, October 1970. 17 fig, 42 ref. (Reprint from Journal de Recherches Atmospheriques, Vol 4, No 4, p 153-178, October-December 1969.) AFCRL F 19628-68-C-0057.

Descriptors: *Hail, *Freezing, *Cloud physics, *Storms, *Settling velocity, Precipitation (Atmospheric), Meteorology, Storm structure, Winds.

The growth and accumulation of large hailstones take place in the upper part of updrafts; the nature of the updraft may be pulsating, accelerating, or quasi-steady for a short duration. The growth of hail is mainly due to accretion of supercooled droplets in the size range of about 60 to 200 microns. The hailstone growth mainly takes place at levels where the temperatures are between -4 deg C and -30 deg C. Above the -30 deg C isotherm, most drizzle-size supercooled drops freeze and, hence, the growth substantially decreases. A liquid water content of 3 to 6 g per cu m is adequate to obtain large hailstones in about 20 minutes, starting with an embryo size of 5 mm. (See also W72-09201) (Knapp-USGS)
W72-09205

ESTIMATION OF THE OCCURRENCE OF HAIL AND HAILSTONE SIZES,
State Univ. of New York, Albany.
N. R. Gokhale, and K. M. Rao.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 39-40, October 1970. 3 fig, 6 ref. AFCRL F 19628-68-C-0057.

Descriptors: *Hail, *Freezing, *Cloud physics, *Storms, *Settling velocity, Precipitation (Atmospheric), Meteorology, Storm structure, Winds.
Identifiers: *Nomograms, Hail prediction.

Parameters important for the formation and occurrence of hail are (a) cloud base height and temperature, (b) height of the -4 deg C to -30 deg C temperature region, and (c) duration for which the intensity of the radar echo exceeded 55 db (10 cm radar). Curves are given to show the temperature range within which the freezing of different size supercooled drops occurs. The warmest is -4 deg C and the coldest temperature is-30 deg C for the diameter range of 5.75 mm and 0.1 mm. A nomogram is given to relate the size of hailstone with cloud base temperature, radar reflectivity and duration. (See also W72-09201) (Knapp-USGS)
W72-09206

THE SEEDING OF ICE SATURATED LAYERS IN THE ATMOSPHERE: A COMPUTATIONAL STUDY,
State Univ. of New York, Albany. Dept. of Atmospheric Sciences.
G. G. Lala.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 41-57, October 1970. 11 fig, 5 ref.

Descriptors: *Cloud seeding, *Weather modification, *Cost analysis, Halides, Nucleation, Silver iodide, Mathematical models, Evaluation.

The growth rate of ice crystals in an assumed supersaturation, the time variation of the supersaturation, and the fall distance of ice crystals were calculated. The amount of seeding material needed for a large scale seeding operation under assumed conditions was also calculated. The cost of seeding material for such an operation is negligible when compared to the cost of operating an aircraft for the dispersal of the seeding material. The mass of silver iodide required to form a sizable cirrus canopy for six hours was about 1 kg. The calculations indicated the possibility of production of significant cloud cover with effect extending far downwind. (See also W72-09201) (Knapp-USGS)
W72-09207

AN OPTICAL LIGHTNING DETECTOR,
State Univ. of New York, Albany.
R. A. Cudney, and B. Vonnegut.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 58-60, October 1970. 1 fig.

Descriptors: *Instrumentation, *Lightning, *Monitoring, Data collections.
Identifiers: *Lightning detector.

An optical flash detector sensitive to low light level transients detects and counts lightning discharges. This instrument differs from other such devices in being low in cost, designed for portable battery-powered operation, and having extremely rapid response. It has the further virtue of being able to distinguish to a limited extent between lightning and man-made light transients. The sensitivity of the instrument is about .01 mw/sq cm at 10 kc, or about ten times that of the human eye. (See also W72-0920[illegible] Knapp-USGS)
W72-09208

THE DESIGN, CONSTRUCTION, AND USE OF AN ICE CRYSTAL COUNTER FOR ICE CRYSTAL CLOUD STUDIES BY AIRCRAFT,
State Univ. of New York, Albany. Dept. of Atmospheric Sciences.
J. D. McTaggart-Cowan, G. G. Lala, and B. Vonnegut.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 62-67, October 1970. 11 fig, 24 ref. (Reprint from Journal of Applied Meteorology, Vol 9, No 2, p 294-299, April 1970.) Contract No. AFCRL F 19628-68-C-0057.

Descriptors: *Instrumentation, *Clouds, *Meteorological data, *Ice, *Crystals, Data collections, Aircraft, Cloud physics, Meteorology.
Identifiers: *Ice crystal counter (Clouds).

A real-time measurement may be made of the number of ice crystal particles per unit volume in cirriform clouds using an airborne instrument based on the mechanisms of contact electrification, as applied to the collision between a stainless steel wire and an ice crystal. The signal conditioner, which employs a series of integrated circuits, converts the frequency of crystal collisions into a voltage. (See also W72-09201) (Knapp-USGS)
W72-09209

LARGE VERTICAL WIND TUNNEL FOR HYDROMETEOR STUDIES,
State Univ. of New York, Albany.
J. D. Spengler, and N. R. Gokhale.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 68-72, October 1970. 5 fig, 18 ref. Contract No. AFCRL F 19628-68-C-0057. NSF Grant GA 1568.

Descriptors: *Instrumentation, *Cloud physics, *Raindrops, *Rainfall simulators, Laboratory tests, Atmospheric physics, Hail.
Identifiers: *Wind tunnels, *Raindrop interaction.

The large vertical wind tunnel of the Atmospheric Science Department, State University of New York at Albany, facilitates the study of interactions of high concentrations of freely suspended hydrometeors. Using a vibrostaltic pump, which pulses a stream of water, uniform size drops can be generated at a rate of 120 per second and a high liquid water content can be obtained in a localized region of the wind tunnel. Drops remain in the working volume for several minutes. Using high speed cameras, droplet interactions can be recorded at full framing rates of 10 to 10,000 f.p.s. and at half framing rates of 20 to 20,000 f.p.s. (See also W72-09201) (Knapp-USGS)
W72-09210

DESIGN, CONSTRUCTION AND TESTING OF THE DROPSONDE,
State Univ. of New York, Albany.
R. T. Nelson, and N. R. Gokhale.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 73-79, October 1970. 6 fig.

Descriptors: *Instrumentation, *Particle size, *Raindrops, *Clouds, Data collections,

Meteorological data, Cloud physics, Distribution patterns.
Identifiers: Drop sondes (Meteorological), Electric potential.

A dropsonde program was initiated in September 1967 to test the feasibility of obtaining data on the concentration and drop-size distribution in the vertical of a cumulus cell. The dropsondes are completely reusable, requiring only a change of chart paper and batteries. Major limitations on any drop are that the sonde must be dropped within the recovery zone and into clouds having temperatures above 0 deg C. The sonde falls through a cloud at nearly 20 meters per second, faster than any raindrop and intercepting any precipitation in its path. Through an opening in the nose of the sonde, any raindrop in its path impacts on a continuously moving chart paper. Then the drop imprint is preserved immediately by a light developing process. The paper then can be rolled up without destroying the images of the original drops produced. A continuous raindrop size spectrum and concentration versus height is thus obtained. (See also W72-09201) (Knapp-USGS)
W72-09211

CHARGING OF DROPLETS BY IMPULSE CORONA,
State Univ. of New York, Albany.
C. T. Phelps, and B. Vonnegut.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 80-87, October 1970. 5 fig, 4 tab, 12 ref. (Reprint from Journal of Geophysical Research, Vol 75, No 24, p 4483-4490, August 20, 1970.) Contract No. AFCRL F 19628-68-C-0057.

Descriptors: *Raindrops, *Electrical studies, *Cloud physics, *Rainfall, *Lightning, Electric arcs, Meteorology, Storm structure, Thunderstorms, Precipitation (Atmospheric).
Identifiers: Charged droplets (Clouds), Electric potential.

Impulse coronas of both polarities were produced within a cloud of droplets atomized from a solution of glycerin and water. The observed charging of droplets with radii in the range 2.5 to 15 microns is characterized by a maximum surface charge density that is nearly constant down to about 6 microns and increases for radii below that if other electric and geometric parameters are fixed. The largest surface charge densities observed for droplets with radii above 6 microns are approximately 4 millionths of a coul per sq m for positive corona and 6 millionths of a coul per sq m for negative corona. Different charging mechanisms are suggested for the two corona polarities. With positive corona the droplet charging results from direct interaction between the positive streamers and the droplets. These findings indicate a possible link between the lightning discharge and subsequent rapid cloud droplet growth. (See also W72-09201) (Knapp-USGS)
W72-09212

FIELD-ENHANCED PROPAGATION OF POSITIVE STREAMERS AND IMPLICATIONS TO ELECTRICALLY INFLUENCED DROPLET COALESCENCE,
State Univ. of New York, Albany.
C. T. Phelps.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 88-91, October 1970. 6 ref.

Descriptors: *Raindrops, *Electrical studies, *Cloud physics, *Rainfall, *Lightning, Electric arcs, Meteorology, Storm structure, Thunderstorms, Precipitation (Atmospheric).
Identifiers: Charged droplets (Clouds), Electric potential.

In order to understand the electrically influenced processes that take place in a thundercloud, it is necessary to know the effect of the lightning discharge on the droplet charge spectrum. In general, gross neutralization of a charge cell is accomplished by the discharge. Impulse corona processes and their interactions with cloud droplets are of particular interest, since these processes establish the extent and some aspects of the character of the discharge pattern in space. Recent experiments show that droplets can acquire substantial charges through interactions with impulse corona of either polarity. Electric-field measurements made from aircraft flying near electrically active cumulonimbus cells yielded maximum values of about 1/3 of the experimentally observed critical field. Of the possible corona processes that could be associated with a lightning discharge, only positive streamers are capable of charging great numbers of cloud droplets throughout a large volume. The maximum positive charge a cloud droplet might acquire by interaction with a positive streamer is about an order of magnitude higher than the estimated charge held by a typical cloud droplet of the same size in a charge cell of an active cumulonimbus. Since the streamers must advance toward and into a negatively charged region, these droplets will always have the opposite polarity of the surrounding droplets. These positively charged droplets should be rapidly neutralized by coalescence with nearby negatively charged droplets. In this way the droplet size spectrum is suddenly altered in a fashion that should favor a more rapid growth of precipitation. (See also W72-09201) (Knapp-USGS)
W72-09213

SUBMICROSCOPIC AEROSOLS FROM ELECTRICALLY STRESSED WATER SURFACES,
State Univ. of New York, Albany.
E. Barreto.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 94-126, October 1970. 13 fig, 1 tab, 34 ref. Contract No. AFCRL F 19628-68-C-0057.

Descriptors: *Electrical studies, *Rainddrops, *Aerosols, *Cloud physics, Lightning, Rainfall, Precipitation (Atmospheric), Thunderstorms.
Identifiers: Aerosols (Electrically charged), Electric potential, Charged droplets (Clouds).

Both positive and negative drops a few millimeters in diameter, resting on metal electrodes, produce charged aerosols. Conical drop configuration intensifies the electric field at the tip of the cone but produces subsequent behavior dependent on polarity: a negative cone produces aerosol prior to air ionization, but a positive cone first produces air ionization, which leads to the formation of the aerosol. A thermodynamic theory is presented to explain the formation of the aerosol in the absence of breakdown; it also explains, in terms of pressure variations produced by the field, the reason why isolated dielectric drops elongate either along or perpendicular to the direction of the applied field. Ionization at the tip of a positive cone is of the positive streamer type followed by periods of steady current, which produce accumulations of negative space charge within the water. This negative charge is of sufficient magnitude to produce an aerosol. With either polarity, the aerosol constitutes a space charge that completely controls the action of the applied field on the drop of water. (See also W72-09201) (Knapp-USGS)
W72-09214

EFFECT OF ELECTRIC FIELD ON CHARGE SEPARATION BY THE FALLING PRECIPITATION MECHANISM IN THUNDERCLOUDS,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
A. K. Kamra.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 127-130, October 1970. 4 fig, 8 ref. (Reprint from Journal of Atmospheric Sciences, Vol 27, No 8, p 1182-1185, November 1970.) Contract No. AFCRL F 19628-68-C-0057.

Descriptors: *Raindrops, *Electrical studies, *Cloud physics, *Rainfall, *Lightning, Electric arcs, Meteorology, Storm structure, Thunderstorms, Precipitation (Atmospheric).
Identifiers: Charged droplets (Clouds), Electric potential.

Rates of growth of the electric field by the induction charging mechanism in thunderclouds are calculated for various precipitation rates. In addition to point-discharge currents below the thundercloud and conduction currents inside the thundercloud as leakage currents, electrical forces acting on precipitation and smaller size particles are important in determining the maximum electric field and the rate of charge separation in thunderclouds. The theory is qualitatively generalized for any charge generating mechanism based on the falling precipitation mechanism. (See also W72-09201) (Knapp-USGS)
W72-09215

MINIATURE WHIRLWINDS PRODUCED IN THE LABORATORY BY HIGH-VOLTAGE ELECTRICAL DISCHARGES,
State Univ. of New York, Albany.
R. T. Ryan, and B. Vonnegut.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 131-133, October 1970. 3 fig, 9 ref. (Reprint from Science, Vol 168, p 1349-1351, June 12, 1970.) Contract Nos. ONR N00014-67-C-0544 and NR 082-237/6.4.68. AFCRL F 19628-68-C-0057.

Descriptors: *Electrical studies, *Thunderstorms, *Cloud physics, *Tornadoes, *Lightning, Storms, Winds, Laboratory tests, Vortices.
Identifiers: Electric potential.

Laboratory experiments show that under certain conditions of vorticity the electrical heating produced by a high-voltage discharge at atmospheric pressure can cause the formation of a miniature tornado-like vortex. Once it forms, this vortex stabilizes the electrical discharge along its axis and changes its character from that of a spark to a high-pressure variety of a glow discharge. By relating observations and measurements made in these experiments to previous work and to analogous situations in nature, it is concluded that the heating produced by electrical discharges in a large storm may play a significant role in forming and maintaining natural tornadoes. (See also W72-09201) (Knapp-USGS)
W72-09216

EYEWITNESS TORNADO OBSERVATIONS OBTAINED WITH TELEPHONE AND TAPE RECORDER,
State Univ. of New York, Albany.
R. T. Ryan, and B. Vonnegut.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 134-139, October 1970. 3 fig, 1 tab, 5 ref. (Reprint from Weathervane, p 126-131, June 1970.) Contract No. AFCRL F 19628-68-C-0057.

Descriptors: *Electrical studies, *Thunderstorms, *Tornadoes, *Data collections, *Weather data, Lightning, On-site data collections, Surveys.
Identifiers: *Interviews, Electric potential.

Tape-recorded telephone interviews were used to collect information about the luminous electrical discharges sometimes associated with tornadoes. Although electrical manifestations appear to be common in the general vicinity of the tornado, only rather rarely, perhaps in a few percent of the eyewitness accounts, is there evidence of electri-

cal activity in the funnel itself. Possibly this luminous activity sometimes present in the funnel may be the result of the strong electrification that can be generated by the intense tornado winds as they pass over the earth's surface. Alternatively, it is possible that these luminous discharges sometimes observed in the funnel may be produced by the strong thundercloud electrical activity. In this case, the electrical power generated throughout a large volume of the thundercloud would be concentrated and released within the funnel, perhaps contributing significantly to its energy. (See also W72-09201) (Knapp-USGS)
W72-09217

POINT DISCHARGE CURRENT IN BLACKWELL, OKLAHOMA, JUNE 1969 - SEPTEMBER 1970,
State Univ. of New York, Albany.
B. Vonnegut, and R. A. Cudney.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 140-141, October 1970. 1 fig.

Descriptors: *Electrical studies, *Tornadoes, Lightning, Thunderstorms, Oklahoma, Cloud physics, Data collections, Storms, Winds.
Identifiers: Electrical discharge, Electric potential, *Blackwell (Okla).

Measurements of point discharge current from artificial points were made using three instruments situated in and around Blackwell, Oklahoma, in an attempt to discern the effects of tornadoes on the point discharge current, and to ascertain the ratio of current flow to and from the earth during periods of point discharge. Data collected from March 1969 to September 1970 are tabulated. For the computation of the ratio of negative to positive point discharge current (the convention being that negative point discharge current implies an electron flow to the earth) the contribution of each instrument was added over a period of a month and averaged with the other instruments. The average ratio of 1.79:1 agrees well with that presented by other investigators. (See also W72-09201) (Knapp-USGS)
W72-09218

MOUNTAIN-PEAK POTENTIAL-GRADIENT MEASUREMENTS AND THE ANDES GLOW,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
R. Markson, and R. Nelson.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 142-152, October 1970. 8 fig, 1 tab, 19 ref. (Reprint from Weather, Vol 25, No 8, p 350-360, August 1970).

Descriptors: *Electrical studies, *Lightning, *Thunderstorms, *Meteorology, *Mountains, Weather, Storms, Orography.
Identifiers: *Electrical discharge, Andes, Electric potential.

'Andes glow' or 'Andes lights' are terms used to describe illumination seen at night in the vicinity of mountain peaks. While the majority of reports have come from the Andes mountains of Bolivia, Chile and Peru, this phenomenon has also been reported in the European Alps, Mexico and Lapland. These light displays can occur under cloudless skies. Sometimes they are but one single flash, while at other times they may persist intermittently for hours. On occasion, a periodicity has been noted in the time between flashes. At their most spectacular they have been described as '...not only clothing the peaks, but producing great beams, which can be seen miles out at sea.' They seem to favor particular mountain peaks where often they can be seen during the dry season. Very low humidity is frequently mentioned as the dominating meteorological factor when Andes lights are seen. Rather than lightning, the Andes lights may be a large scale Saint Elmo's Fire with many points across the mountain top producing corona discharge. Observations at the summits of two Mexican volcanoes showed electric fields as large as 3100 V/m. This is a 25-times magnification of the normal field-strength, and would be sufficient to set sharp points into corona discharge. At the time of the measurements it is unlikely that factors other than geometrical packing of field lines by the mountain and sharp points in addition to the electrode effect had any influence. See also W72-09201) (Knapp-USGS)
W72-09219

AIRBORNE AND GROUND MEASUREMENTS OF THE ATMOSPHERIC POTENTIAL GRADIENT DURING A SOLAR ECLIPSE,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
R. Markson, and A. K. Kamra.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 153-159, October 1970. 3 fig, 5 ref. (Reprint from Journal of Atmospheric and Terrestrial Physics, Vol 33, No 7, p 1107-1113, July 1971).

Descriptors: *Electrical studies, *Atmospheric physics, Virginia, Weather, Meteorology.
Identifiers: Solar eclipse, Electric potential.

Airborne and ground measurements of the atmospheric potential gradient were made during the total solar eclipse of 7 March 1970 at Norfolk, Virginia. The ground measurements indicate the potential gradient tends to reduce during and immediately after the eclipse. The airborne measurements suggest possible enhancement and increased variability of the potential gradient during the central portion of the eclipse. (See also W72-09201) (Knapp-USGS)
W72-09220

CONSIDERATIONS REGARDING SOLAR AND LUNAR MODULATION OF GEOPHYSICAL PARAMETERS, ATMOSPHERIC ELECTRICITY AND THUNDERSTORMS,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
R. Markson.
In: Structure and Modification of Clouds and Fogs, Air Force Cambridge Research Laboratories Contract Report AFCRL-71-0041, p 160-201, October 1970. 33 fig, 1 tab, 57 ref. (Reprint from Pure and Applied Geophysics (Pageoph), Vol 84, No 1, p 161-202, 1971). Contract No AFCRL F 19628-68-C-0057. ONR N00014-67-C-0544.

Descriptors: *Meteorology, *Synoptic analysis, Weather, Climates, Atmospheric physics, Satellites (Artificial), Solar radiation, Weather forecasting.
Identifiers: *Extraterrestrial effects (Meteorological).

The scope of meteorology should include, besides the earth's atmosphere, the sun's atmosphere (the solar corona), the associated interplanetary magnetic field, and lunar modulation of the magnetic environment. The shape and characteristics of the magnetosphere have been completely redefined during the last ten years from a simple magnetic dipole to the present model with an elongated tail stretched out by the solar wind. The interplanetary magnetic field has been defined with its spiral structure and sectors tied into the solar surface. This provides a magnetic link between the sun and earth. It is probable that extra-terrestrial factors play a role in regulating weather, although the extent of this influence remains to be determined. Possibly such effects are most significant or easily detectable in the realm of atmospheric electricity. Research into these effects could lead to a better understanding of atmospheric circulation, precipitation mechanisms and thunderstorms. The field of meteorology which might particularly benefit from such research is long-range weather forecasting. (See also W72-09201) (Knapp-USGS)
W72-09221

BOMEX TEMPORARY ARCHIVE DESCRIPTION OF AVAILABLE DATA,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Science and Technology.
For primary bibliographic entry see Field 07C.
W72-09263

A HYDROMETEOROLOGICAL DATA APPRAISAL AND DESIGN STUDY IN CERTAIN RIVER BASINS IN THE WESTERN UNITED STATES.
North American Weather Consultants, Goleta, Calif.

Available NTIS, Springfield, Va. 22151 PB-204 939; $6.00 paper copy, $0.95 microfiche. Final Contract Report No 15-15 (REC-1?-06-D-7053-F) July 1971. 351 p, 5 fig, 6 tab. USBR Contract 14-06-D-7053.

Descriptors: *Meteorological data, *Network design, *Hydrology, *Data collections, *River basins, Reviews, Appraisals, Evaluation, Planning, Watershed management, Climatic data, Precipitation (Atmospheric), Storms, Cloud seeding, Weather modification, Model studies.
Identifiers: *Missouri River basin, *Snake River basin, *Bear-Wasatch River basin, *North Platte River basin, *Rio Grande River basin, Western U.S..

The adequacy of present hydrometeorological information is appraised in five western basins for atmospheric water resources planning in the mid-1970's. The five basins are the Missouri, Snake, Bear-Wasatch, North Platte, and Rio Grande. The appraisal includes recommendations and preliminary designs for supplementing the existing network. The data requirements for atmospheric water resources planning are defined largely by reference to the cloud seeding models and special climatologies now in use, and their anticipated development in the next several years. The necessary inputs to these models and special climatologies include such items as standard meteorological station data, streamflow data, snowcourse data, rawinsonde data, weather radar data, and special cloud physics data. A catalog of relevant hydrometeorological data sources is presented. A preliminary design of instrumentation for data collections is presented along with a list of recommended sites in each basin. A plan for instrument maintenance, data collection, reduction, and quality control is outlined. (Woodard-USGS)
W72-09272

INFORMATION BULLETIN ON HYDROMETEOROLOGICAL INSTRUMENTS AND INVESTIGATION TECHNIQUES (INFORMATSIONNYYE MATERIALY PO GIDROMETEOROLOGICHESKIM PRIBORAM I METODAM NABLYUDENIY).
Scientific Research Inst. of Hydrometeorological Instruments, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W72-09278

METEOROLOGICAL EFFECTS OF COOLING TOWER PLUMES,
Air Resources Atmospheric Turbulence and Diffusion Lab., Oak Ridge, Tenn.
S. R. Hanna.
Typescript, January 25, 1971. 17 p, 6 tab, 5 ref.

Descriptors: *Cooling towers, *Water cooling, *Atmospheric physics, *Clouds, *Thermal powerplants, Cloud physics, Meteorology, Atmospheric water, Water cooling, Cooling water, Thermal pollution, Heat pollution, Pollution (Thermal), Energy dissipation, Energy conversion, Air environment, Environmental effects, Water towers.
Identifiers: *Meteorological effects, *Cloud formation.

The amounts of energy and moisture emitted to the atmosphere by cooling towers are compared to

the production of energy and moisture by meteorological processes. The energy input from a large (1000 MW) power plant is a significant fraction of the energy production of mesoscal atmospheric phenomena such as thunderstorms. Methods for calculating the rise of cooling tower plumes and the possibility of cloud formation due to these plumes are described. The height of rise of a moist plume can be approximate estimated using simple formulas, but the depth and amount of cloud cannot be easily estimated. Similar formulas can be used to calculate plume and cloud growth when the wind speed is greater than zero. The bases for all these formulas are the theory of plume rise from isolated stacks and the theory of cumulus cloud growth. (Poertner)
W72-09305

TOPOGRAPHIC EFFECTS APPARENT IN NOCTURNAL TEMPERATURE PROFILES IN A CONIFER CANOPY,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02D.
W72-09608

FLOAT IMPLOSION IN OBSERVATION WELL IN KENTUCKY,
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 04B.
W72-09621

DEUTERIUM CONTENT OF SNOW AS AN INDEX TO WINTER CLIMATE IN THE SIERRA NEVADA AREA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02C.
W72-09622

FORMATION OF HEAVY PRECIPITATION IN THE CENTRAL STEPPE XONE OF THE AZERBAYDZHAN (USLOVIYA FORMIROVANIYA ZNACHITEL'NYKH OSADKOV NAD TSENTRAL'NOSTEPNOY ZONOY AZERBAYDZHANSKOY SSR),
Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Institut Geografii.
I. A. Ismaylov.
'Elm', Baku, 1969. 122 p.

Descriptors: *Precipitation (Atmospheric), *Local precipitation, *Precipitation intensity, *Rainfall disposition, *Orography, Meteorology, Atmosphere, Fronts (Atmospheric), Air circulation, Air masses, Cyclones, Anticyclones, Winds, Atmospheric pressure, Synoptic analysis, Climatology, Arctic, Polar regions, Seasonal, Investigations.
Identifiers: *USSR, *Azerbaydzhan SSR, *Orographic rainfall, *Heavy precipitation, *Synoptic meteorology, Polar front, Cold front, Warm front.

Investigations were conducted in 1952-61 in the Azerbaydzhan SSR (1) to determine the types of air circulation processes responsible for formation of heavy precipitation (10 mm or more in a 24-hour period) in the central steppe zone of the Republic; (2) to examine and refine present concepts of the mechanism of precipitation-producing conditions in the area; and (3) to establish basic patterns in the interaction of synoptic processes leading to heavy precipitation formation with the local complex orography. A total of 203 periods of heavy rains was analyzed. The percentage of heavy, steady rains of frontal origin in the zone was 94.1, of which 31.5% was associated with arctic air, 37.7% with cold air of middle latitudes, and 30.8% with polar fronts. Most of the rain storm (69.2%) were genetically associated with cold fronts and were generally formed in the dying stages of cold air intrusion into Azerbaydzhan. (Josefson-USGS)
W72-09745

ATMOSPHERIC PRECIPITATION IN THE ARMENIAN SSR (ATMOSFERNYYE OSADKI V ARMYANSKOY SSR),
Akademiya Nauk Armyanskoi SSR, Erevan. Institut Geologicheskikh Nauk.
G. A. Aleksandryan.
Yerevan, 1971. 180 p.

Descriptors: *Meteorology, *Precipitation (Atmospheric), *Precipitation intensity, *Rainfall disposition, *Depth-area-duration analysis, Curves, Distribution patterns, Areal, Orography, Climatic zones, Air masses, Air circulation, Air temperature, Runoff, Gages, Time, Seasonal, Mathematical studies, Synoptic analysis, Maps.
Identifiers: *USSR, *Armenia, *Orographic precipitation, Aerology, Polar front.

A study was made of the formation of atmospheric precipitation in the Armenian SSR, which covers an area of 29,717 sq km. Territorial distribution of annual, seasonal, and monthly precipitation totals for the republic was examined in terms of the complex orography of the region. Basic information about precipitation amounts was supplied by a total of 268 hydrometeorological stations, including 172 in Armenia, 46 in Azerbaydzhan, 24 in Georgia, and 26 in Turkey and Iran. (Josefson-USGS)
W72-09746

LONG-TERM CYCLIC FLUCTUATIONS OF ATMOSPHERIC PRECIPITATION IN THE USSR (MNOGOLETNIYE TSIKLICHESKIYE KOLEBANIYA ATMOSFERNYKH OSADKOV NA TERRITORII SSSR),
Main Geophysical Observatory. Leningrad (USSR).
O. A. Drozdov, and A. S. Grigor'yeva.
Gidrometeoizdat, Leningrad, 1971. 160 p.

Descriptors: *Meteorology, *Precipitation (Atmospheric), *Cycles, *Fluctuations, Variability, Air temperature, Air circulation, Seasonal, Dry seasons, Geographical regions, Climatology, Statistical methods, Correlation analysis, Time series analysis, Frequency analysis, Forecasting, Probability, Markov processes, Maps, Methodology.
Identifiers: *USSR, *Autocorrelation, Anomalies, Space-time characteristics (Rainfall).

Investigations of long-term cyclic fluctuations of precipitation in the USSR for cold (November-March) and warm (April-October) seasons were based on precipitation data of 76 stations for the period 1891-1960. The variability of precipitation amounts was examined in 3 chapters: (1) methods of investigation of cyclic fluctuations, with emphasis on techniques for study of nonstationary time series and possible application of autocorrelation to a wide range of frequencies; (2) contributions of cycles to precipitation fluctuations in different geographical regions; and (3) application of results of cycle analysis to basic problems in climatology and long-range forecasting. Precipitation cycles for 1891-1960, air circulation cycles, and maps forecasting precipitation anomalies for 1966-85 are examined in separate appendices. (Josefson-USGS)
W72-09747

CATALOGUE OF METEOROLOGICAL DATA OF THE SNOWY MOUNTAINS REGION, AUSTRALIA.
Snowy Mountains Hydro-Electric Authority, Cooma (Australia).
For primary bibliographic entry see Field 07C.
W72-09771

2C. Snow, Ice, and Frost

STRUCTURE AND MODIFICATION OF CLOUDS AND FOGS,
State Univ. of New York, Albany. Research Foundation.
For primary bibliographic entry see Field 02B.
W72-09201

EXPERIMENTAL STUDIES OF FREEZING, WAKE EFFECT, AND BREAKUP OF FREELY SUSPENDED SUPERCOOLED WATER DROPS,
State Univ. of New York, Albany.
For primary bibliographic entry see Field 02B.
W72-09204

THEORY OF HAIL GROWTH,
State Univ. of New York, Albany.
For primary bibliographic entry see Field 02B.
W72-09205

ESTIMATION OF THE OCCURRENCE OF HAIL AND HAILSTONE SIZES,
State Univ. of New York, Albany.
For primary bibliographic entry see Field 02B.
W72-09206

THE SEEDING OF ICE SATURATED LAYERS IN THE ATMOSPHERE: A COMPUTATIONAL STUDY,
State Univ. of New York, Albany. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 02B.
W72-09207

THE DESIGN, CONSTRUCTION, AND USE OF AN ICE CRYSTAL COUNTER FOR ICE CRYSTAL CLOUD STUDIES BY AIRCRAFT,
State Univ. of New York, Albany. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 02B.
W72-09209

AGE OF THE LAST GLACIAL MAXIMUM IN THE WESTERN DVINA-DNIEPER INTERFLUVE (VOZRAST MAKSIMAL'NOY STADII POSLEDNEGO OLEDENENIYA NA MEZHDURECH'YE ZAPADNOY DVINY I DNEPRA),
Leningrad State Univ. (USSR).
Kh. A. Arslanov, L. N. Voznyachuk, F. Yu. Velickevich, L. V. Kur'yerova, and G. S. Petrov.
Akademiya Nauk SSSR Doklady, Vol 196, No 1, p 161-164, 1971. 1 tab, 15 ref.

Descriptors: *Glaciation, *Glaciers, *Glacial sediments, *Age, *Radioactive dating, Ice, Glacial drift, Lake sediments, Alluvium, Loam, Sands, Silts, Geomorphology, Plant groupings, Dendrochronology, Palynology, Pollen, Spores, Rivers, Interfluves.
Identifiers: *USSR, *Belorussian SSR, *Western Dvina River, *Dnieper River, *Glacial maximum, Glacial advance, Glacial plain, Interglacial, Interstadial, Carpology.

Dating of the maximum advance of the last glaciation is important for determining the causes, history, and dynamics of glaciation; the growth and decay rates of glaciers; and the age of glacial and periglacial sediments, frost structures, and topography. Investigations were conducted near the town of Surazh in the Vitebsk Oblast (Belorussian SSR) for direct dating of sediments of the last glacial maximum from the radiocarbon of their plant detritus. Geomorphologically, the area is a glacial lacustrine plain, lying between belts of peripheral glacial deposits of the Vitebsk and Braslav phases of degradation of the last European ice sheet, 60 km north of the boundary of the Valday Glaciation. The Valday ice and its terminal moraines on the Surazh lowland of the Western Dvina-Dnieper interfluve are approximately 17 to 18 thousand years old. (Josefson-USGS)
W72-09255

GLACIERS AND GEOLOGICAL EVOLUTION OF THE EARTH (OLEDENENIYA I GEOLOGICHESKOYE RAZVITIYE ZEMLI),
G. N. Nazarov.
Izdatel'stvo 'Nedra', Moscow, 1971. 152 p.

Descriptors: *Glaciation, *Glaciers, *Glaciology, *Geology, Structural geology, Geophysics, Gravity studies, Magnetic studies, Movement, Cycles, Polar regions, Ice, Oceans, Water level fluctuations, Atmosphere, Air masses, Energy budget, Heat balance, Radiation, Quaternary period.
Identifiers: *USSR, *Lithosphere, *Hydrosphere, *Glacial cycles, *Polar glaciers, Mantle, Crust, Crust movement, Asthenosphere, Tectonics.

The causes of glacial cycles and the processes which occur during formation, growth, and decay of an ice cover are examined. These processes include movements of water and air masses; compensatory movements of the earth's crust and subcrustal masses; variations in the earth's rotation and magnetic field; and displacements of the earth's axis of rotation and center of gravity. Analysis of the complex interrelationships of glacial, tectonic, and other phenomena was based on studies of (1) the origin and distribution of earth's glaciers; (2) the processes accompanying the evolution of high-polar glaciers; (3) the processes related to decay of high-polar glaciers; (4) the glacial cycles and their duration; (5) the short-period movements of air and water masses and their effect on the dynamics and energy budget of the earth; and (6) the role of glacial periods in the evolution of the earth. (Josefson-USGS)
W72-09279

RIGHTS AND RESPONSIBILITIES OF ARCTIC COASTAL STATES: THE CANADIAN VIEW,
Department of External Affairs, Ottawa (Ontario).
For primary bibliographic entry see Field 06E.
W72-09465

PERMAFROST EROSION ALONG THE BEAUFORT SEA COAST,
Denver Univ., Colorado. Dept. of Geography and Geology.
For primary bibliographic entry see Field 02J.
W72-09546

ARCTIC WASTE MANAGEMENT,
Alaska State Dept. of Health and Welfare, College.
For primary bibliographic entry see Field 05D.
W72-09601

THE RELATION OF SNOW TRANSPARENCY TO DENSITY AND AIR PERMEABILITY IN A NATURAL SNOW COVER,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
J. D. Bergen.
Journal of Geophysical Research, Vol 76, No 30, p 7385-7388, 1971. 2 tab, 9 ref.

Descriptors: *Snow, *Light penetration, *Optical properties, Snow cover, Ambient light, Solar radiation, Light, Opacity, Permeability.

Illumination at various levels in an undisturbed snow cover was measured with CdS cells at intervals during the winter, along with air permeability and density. Extinction coefficients for particular layers increased with time. Measured values in the snow layer near the soil ranged from 0.072 cm-1 to 0.313 cm-1, computed as an average for light in the 0.5 to 0.7-micron region. Coefficients for higher levels varied from 0.059 cm-1 to 0.148 cm-1. A relation between the extinction coefficient, air permeability, and density based on the Carmen-Kozney assumption predicts the observed values with fair accuracy. (Forest Service)
W72-09607

THE RELATIONSHIP BETWEEN DENSITY AND TENSILE STRENGTH IN SNOW,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. A. Sommerfeld.
Journal of Glaciology, Vol 10, No 60, p 357-362, 1971.

Descriptors: *Snow, Snow cover, Strength, Avalanches, *Density, *Tensile strength, Utah, Colorado.
Identifiers: *Alta (Utah), Berthoud Pass (Colo).

'Weakest link' theories predict that the brittle fracture of snow is inherently a statistical problem. The probability of failure of snow in centrifugal tensile tests is shown to be a function of sigma/sigma m where sigma is a characteristic strength (a maximum strength) which is a function of density rho alone. Similar probabilities of faulure are obtained for measurements at Alta, Utah, and Berthoud Pass, Colorado where the characteristic strength is obtained from the relationship log sigma m = 4.3 + 3 log rho. (Forest Service)
W72-09611

TAKE THE PLUNGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. Martinelli, Jr.
Ski Area Management, Vol 11, No 1, 1972. p 27-28.

Descriptors: *Snow management, *Skiing, *Snowpacks, Instrumentation.
Identifiers: Snow hardness, Snow trafficability, Snow instrumentation, Ski slope packers, Ski slope grooming.

The rammsonde, an impact penetrometer, gives a quick and objective way to evaluate hardness of snow cover produced by a variety of ski slope grooming machines. Snow hardness increased tenfold immediately after packing--little additional increase for next 3 hours, then an additional threefold increase overnight. Specifications are given for building a rammsonde and field procedure and notes for measuring hardness with the rammsonde are explained and illustrated. (Forest Service)
W72-09612

RIME CONTRIBUTES TO WATER BALANCE IN HIGH-ELEVATION ASPEN FORESTS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
Journal of Forestry, Vol 70, No 2, p 92-97, 1972. 2 fig, 2 tab, 3 ref.

Descriptors: *Rime, *Snowpacks, *Water balance, Cloud physics, Evapotranspiration, Fog, Hydrologic cycle, Interception, Wind velocity, New Mexico.
Identifiers: Southern Rocky Mountains, Aspen.

Rime buildup on aspen crowns during the passage of selected winter storms and the amount of rime falling to the snow surface following these storms were studied during three winters in northern New Mexico. For the storms studied, the estimated water equivalent of rime caught on crowns of 50- to 60-foot tall trees on an acre basis ranged from 1.8 to 9.5 mm in depth. Water equivalent of rime subsequently falling to the snow surface for the same storms ranged from 0.6 to 4.2 mm depth per acre. (Forest Service)
W72-09613

DEUTERIUM CONTENT OF SNOW AS AN INDEX TO WINTER CLIMATE IN THE SIERRA NEVADA AREA,
Geological Survey, Denver, Colo.
I. Friedman, and G. I. Smith.
Science, Vol 176, No 4036, p 790-793, May 1972. 2 fig, 1 tab, 10 ref.

Descriptors: *Snowfall, *Deuterium, *Weather forecasting, California, Nevada, Snow surveys, Cores, Moisture content, Recent epoch, Climatic data, Precipitation intensity, Water vapor, Air circulation, Weather patterns, Air temperature.
Identifiers: *Sierra Nevada, Winter climate index, Pacific air masses.

Data are presented on the deuterium content of snow cores which represent the exceptionally heavy snowfall of 1968-69 in the Sierra Nevada area. The winter of 1968-69 produced two to three times the amount of precipitation as the winter of 1969-70. The deuterium content in cores collected at the end of each winter at the same sites shows a depletion in 1968-69 of about 20 per mil. The higher 1968-69 snowfall and the depletion of deuterium can be explained by an uncommonly strong westward flow of cold air over and down the western slopes of the Sierra, which interacted with an eastward flow of moist Pacific air that overrode and mixed with the cold air resulting in greater precipitation and at a lower than normal temperature. Pluvial periods of the Pleistocene may have had the same shift in air-mass trajectory as the wet 1968-69 year. Snow cores for the normal 1970-71 winter have deuterium concentrations that resemble those of the normal 1969-70 winter. Data are tabulated for 39 stations and show elevation, station name, and D:H ratios of snow samples collected on or near April 1, 1969-71. (Lang-USGS)
W72-09622

ICE AND ITS ACTION ON HYDRAULIC STRUCTURES.

Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, 1970.

Descriptors: *Ice, *Ice jams, *Ice loads, *Ice cover, *Conferences, Freezing, Melting, Ice breakup, Floods, Mechanical properties, Cryology, Cold regions.

Ice problems are the topic of the IAHR symposium held at Reykjavic, Iceland, September 1970. The subjects discussed include ice terminology, measurements, ice formation, properties, breakup, control of ice at powerplants, mechanical properties of ice and ice loads. (See W72-09624 thru W72-09642) (Knapp-USGS)
W72-09623

RIVER AND COASTAL ICE PROBLEMS IN ICELAND,
National Energy Authority, Reykjavik (Iceland).
S. Rist.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 0.8, 1970. 1 fig, 5 ref.

Descriptors: *Ice, *Ice jams, *Freezing, Frazil ice, Slush, Iced lakes, Glaciers, Snow, Hydroelectric power, Sea ice, Ice cover.
Identifiers: *Iceland.

The problems of ice in relation to human activities and construction in Iceland are discussed. The major ice problems rise from changing conditions as a result of sudden and intense weather fluctuations. Slush accompanied by winter storms threaten inhabited areas. Powerplants are influenced by river ice, especially by slush ice. Movement and collision of glacier-derived ice blocks in areas of jokulhlaup (glacial bursts) is an unsolved problem. Ice problems related to construction of reservoirs in the highlands are also discussed. (See also W72-09623) (Knapp-USGS)
W72-09624

RIVER AND LAKE ICE TERMINOLOGY,
Foundation of Canada Engineering Corp. Ltd., Toronto (Ontario).
H. R. Kivisild.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 1.0, 1970. 14 ref.

Descriptors: *Ice, *Thesauri, Freezing, Ice breakup, Sea ice, Iced lakes, Ice cover, Cryology.
Identifiers: *Ice terminology.

River and lake ice terms have been evolved gradually in the last 40 years as the processes of ice formation and breakup have become better understood. The IAHR considers it appropriate to contribute to a systematic river and lake ice nomenclature. A set of terms is presented for discussion and approval. The set is presented in English only. The terminology was developed to be in harmony with the work by UNESCO on sea ice. (See also W72-09623) (Knapp-USGS)
W72-09625

ICE MONITORING EQUIPMENT,
B. Kristinsson.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 1.1, 1970. 9 fig, 1 ref.

Descriptors: *Ice, *Rivers, *Monitoring, *Instrumentation, Frazil ice, Slush, Ice cover, Ice jams, Hydroelectric plants, Discharge measurement.
Identifiers: *Iceland.

Monitoring methods for ice phenomena in rivers are described. In some Icelandic rivers ice problems exist in connection with operation of Hydroelectric powerplants. Monitoring equipment was developed for frazil ice discharge, for ice thickness, and for step-bursts. The monitor for frazil ice is described in detail and shorter descriptions are given of the other two types. The frazil ice detector and the ice thickness detectors are based on measurements of electrical conductivity changes. The step burst detector is a pressure sensitive detector. (See also W72-09623) (Knapp-USGS)
W72-09626

THE IOWA LOW TEMPERATURE FLOW FACILITY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
J. F. Kennedy.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 1.2, 1970. 3 fig, 1 ref. NSF Grant GK-2873.

Descriptors: *Ice, *Freezing, *Ice breakup, *Hydraulic models, Cryology, Frazil ice, Ice jams, Ice cover, *Iowa, Flumes, Model studies, Laboratory tests.
Identifiers: *River ice.

The Iowa Institute of Hydraulic Research recently designed and constructed a low temperature flow facility for conduct of research on various aspects of the formation, characteristics, and melting and breakup of river ice. The facility consists of a 40-foot long, 2-foot wide, 1-foot deep, rectangular, recirculating flume mounted on a tiltable truss. The flume is housed in a temperature-controlled room which can be chilled to -20 deg F. The floor and walls of the flume are constructed from specially fabricated heat transfer plates through which a temperature-controlled coolant is circulated. The water flow may also be heated, either directly or through the boundary panels. (See also W72-09623) (Knapp-USGS)
W72-09627

FLOW MEASUREMENTS OF ICE-COVERED RIVERS IN HOKKAIDO,
Hokkaido Electric Co., Sapporo (Japan). Dept. of Civil Engineering.
K. Ohashi, and T. Hamada.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 1.4, 1970. 4 fig, 2 tab, 1 ref.

Descriptors: *Ice cover, *Rivers, *Discharge measurement, Roughness (Hydraulic), Velocity, Streamflow, Stream gages, Hydraulics, Freezing.
Identifiers: *Hokkaido (Japan).

The methods and results of gaging flow of ice-covered rivers with comparatively small catchment areas in Hokkaido, Japan are described. The interrelationships among velocity distribution, irregularity in the cross-sectional form, and roughness coefficient under the ice cover are discussed. Roughness of the underside of the ice cover depends upon the hydraulic and climatic conditions as well as the form effect of the river section. (See also W72-09623) (Knapp-USGS)
W72-09628

CALCULATION OF FRAZIL ICE PRODUCTION,
Thoroddsen and Partners, Reykjavik (Iceland).
S. Freysteinsson.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 2.1, 1970. 5 fig, 7 ref, append.

Descriptors: *Ice, *Rivers, *Frazil ice, Freezing, Discharge (Water), Dams, Hydroelectric plants, Water temperature.
Identifiers: *Iceland.

In some reaches of rivers in Iceland ice production is predominantly frazil ice. Calculations of the frazil ice discharge are of importance in connection with design and energy production studies and ice forecasts for planning operations. Methods for such calculations were developed and good agreement between calculated and observed ice discharge has been obtained at the Burfell damsite on the Thjorsa River. (See also W72-09623) (Knapp-USGS)
W72-09629

TEMPERATURE GRADIENTS IN A LAKE ICE COVER,
Queen's Univ., Kingston (Ontario).
S. S. Lazier, and M. Metge.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 2.3, 1970. 4 fig, 2 ref.

Descriptors: *Ice cover, *Iced lakes, *Lake Ontario, *Temperature, *Ice loads, Ice jams, Pressure, Coastal engineering, Canada.
Identifiers: *Kingston (Ontario).

In order to acquire a better knowledge of static ice forces, a finite difference method was developed for calculating temperature gradients in an ice cover. This method was checked against Taylor's analytical solution and it proved to be precise and simple. Measurements of ice temperatures were carried out during the winter 1969 in Kingston harbour, Ontario, Canada. The gradients predicted using ice surface temperatures were fairly close to those measured, and there is a fundamental difference between the changes in temperature gradients due to solar radiation and those due to changes in air temperature only. (See also W72-09623) (Knapp-USGS)
W72-09630

TEMPERATURE AND FLOW CONDITIONS DURING THE FORMATION OF RIVER ICE,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
J. F. Kennedy.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 2.4, 1970. 7 fig, 4 ref. AEC DACW25-69-C-0098.

Descriptors: *Ice cover, *Rivers, *Iowa, *Water temperature, *Turbulence, Velocity, Roughness (Hydraulic), Ice breakup, Freezing, Melting, Heat balance, Ice-water interfaces.

The temperature and velocity characteristics of flow in rivers during the onset and occurrence of ice covers are described. Vertical and lateral temperature and velocity distributions, and ice thickness and configuration were measured in an Iowa river at frequent intervals during the period of ice cover. The undersurface of the ice remained plane as the ice thickened and became wavy as the ice melted. The shear velocity associated with the wave forms was determined. Just prior to breakup the ice became very porous. The vertical temperature distributions were very uniform over the depth, with a maximum difference over any one vertical profile decreasing from about 0.015 deg C prior to the formation of an ice cover to less than 0.003 deg C under a thick ice cover. Short-term temporal variations, associated with the turbulence structure of the flow, also decreased with the formation and thickening of the ice cover. The lowest temperatures in the lateral direction were consistently in the central parts of the flow with warmer temperatures observed near the banks. The lateral variations under a thick ice cover were small, of the order of a few hundredths of degrees or smaller, until just prior to breakup when larger thermal gradients were found near the shore areas. An ice cover could form with a temperature of 0.7 deg C at mid-depth of the flow when the thermal regime of the river is modified by reservoir and urban effects. Cloud cover was found to exert significant effects on the diurnal variation of river temperature prior to the formation of a permanent ice cover. (See also W72-09623) (Knapp-USGS)
W72-09631

INVESTIGATIONS INTO FRAZIL, BOTTOM ICE AND SURFACE ICE FORMATION IN THE NIAGARA RIVER,
Hydro-Electric Power Commission of Ontario, Toronto.
T. E. Wigle.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 2.8, 1970. 2 fig, 16 photo, 1 ref.

Descriptors: *Ice, *Freezing, *Rivers, *Frazil ice, *Hydroelectric plants, Great Lakes Region, Ice jams, Cryology, Slush, Water temperature, Heat balance, Turbulence.
Identifiers: *Niagara River, Anchor ice.

Flow retardation due to ice in the Niagara River is at times considerable, and causes large reductions in power production. Investigations to obtain an understanding and to establish a practical relationship between ice production and meteorological parameters began in 1966. Bottom ice formations often cover most of the river channel. Direct observations of the evolution of some ice forms are summarized. Surface ice crystals form when the average water temperature is still above the ice point and are drawn down into suspension by turbulence. When the water temperature becomes 0 deg C or below, the crystals adhere to underwater objects. (See also W72-09623) (Knapp-USGS)
W72-09632

HEAT EXCHANGES AND FRAZIL FORMATION,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
T. Carstens.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland:

International Association for Hydraulic Research, Paper 2.11, 1970. 10 fig, 2 tab, 6 ref.

Descriptors: *Ice, *Rivers, *Freezing, Ice cover, Frazil ice, Water temperature, Turbulence, Turbulent flow, Heat balance, Slush, Evaporation.
Identifiers: Anchor ice.

The most important terms in the heat balance of a freezing body of water are radiation, convection and evaporation. Examples are given of empirical approximations of more exact expressions. The heat lost by the water results in freezing after the water has become sufficiently supercooled. When the surface turbulence is strong enough, an ice cover cannot form, and heat losses then produce frazil ice. The cluster or cloud mode of ice is called frazil slush. For velocities exceeding about 1.2 m/sec the turbulence becomes strong enough to suspend the frazil slush and maintain a water surface almost uncovered by ice. The transported ice is now more or less uniformly distributed throughout the whole depth of flow, and some of the locally produced ice, as well as some of the ice from upstream, is accumulated as anchor ice; however, most of the ice moves downstream. At medium flow velocities (0.6 to 1.2 m/sec), the water surface is more or less covered with moving frazil slush, cutting down on the heat loss and the subsequent ice production. The water temperature is at or close to the freezing point. There is little anchor ice and a general tendency for the ice to move on. At low flow velocities (less than 0.6 m/sec) the solid ice cover prevents large heat losses, so the local ice production is small. Frazil slush from upstream is deposited underneath the ice cover, and there is a general tendency for the ice to accumulate. (See also W72-09623) (Knapp-USGS)
W72-09633

ICE COVER FORMATION AND ASSOCIATED HYDRO-DYNAMIC EFFECTS IN THE LOWER PART OF THE RIVER RHINE,
Rijkswaterstaat, The Hague (Netherlands). Directorate for Water Management and Hydraulic Research.
H. M. Oudshoorn.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 3.0, 1970. 12 fig, 3 ref.

Descriptors: *Ice, *Rivers, *Navigation, *Streamflow, Freezing, Ice cover, Streamflow, Dams, Flood control, Ice jams.
Identifiers: *Netherlands, *Rhine River.

In the Netherlands, studies were made on phenomena related to the formation of an ice cover on the various branches of the river Rhine. After completion of the Delta project, the water movement in the area will be changed considerably. To study the possibility of discharging ice to the sea, the movement of drift ice in the estuaries was observed by marking ice floes with dye. The influence of a fast ice cover on the discharge distribution and the water levels was determined by means of gage readings and discharge measurements. The formation of ice dams in the tidal area was investigated and related to flow conditions. (See also W72-09623) (Knapp-USGS)
W72-09634

FORMATION OF PRIMARY ICE LAYERS,
Laval Univ., Quebec. Lab. of Ice Mechanics.
R. O. Ramseier.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 3.1, 1970. 2 fig, 2 tab, 20 ref.

Descriptors: *Ice cover, *Freezing, *Laboratory tests, Frazil ice, Ice jams, Water temperature, Streamflow, Heat balance, Turbulence, Ice.
Identifiers: Primary ice.

The formation of primary ice must be understood to predict the mechanical properties of ice covers. Meteorological and hydrodynamic parameters can be correlated with the texture of primary ice. A review of laboratory studies summarizes the effects of water temperature and current on primary ice crystal formation. Texture is correlated to air temperature at time of formation. The primary ice layer has been defined as the initial ice skim forming on a body of water. On a calm surface its growth is predominantly in the horizontal plane forming a very thin ice layer. The secondary ice grows parallel to the heat flow; usually perpendicular to the water surface. Ice was permitted to form in a tank filled with tap water at air temperatures of -10 and-30 C. Needles first appear, their c-axes tending to be roughly perpendicular to the water surface. This type of primary ice will grow on a calm surface with a small air-water temperature gradient. The crystals tend to be several centimeters in length and contain a large amount of substructure caused by interference of secondary and tertiary dendrite arms. Other forms of primary ice formation are due to the presence of snow or frazil which cause the growth of small grains with random c-axes. With a strong enough wind there will be mechanical action among the free-growing crystals or with the water, reducing the crystal size and favoring a random orientation of the c-axes in the primary layer. (See also W72-09623) (Knapp-USGS)
W72-09635

CHANGE OF VELOCITY DISTRIBUTION IN A CROSS-SECTION OF A FREEZING RIVER AND THE EFFECT OF FRAZIL ICE LOADING ON VELOCITY DISTRIBUTION,
Guelph Univ. (Ontario).
G. Tsang.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 3.2, 1970. 3 fig.

Descriptors: *Ice cover, *Streamflow, *Frazil ice, *Closed conduit flow, Sediment transport, Velocity, Turbulent flow, Freezing, Hydraulics.

Frazil ice in an ice-covered stream significantly increases the boundary shear and greatly affects the magnitude and distribution of the velocity of the flowing water. The presence of an ice cover and a high loading of frazil ice can easily double the maximum velocity of an open channel flow for the same rate of discharge. Velocity distribution equations are given for water flow under an ice cover with a high, or a low, frazil ice loading. As the surface of a river is frozen, the boundary condition of the flow changes. This causes a continuous change in flow pattern in the stream. (See also W72-09623) (Knapp-USGS)
W72-09636

A STUDY ON THE FORMATION OF THE RIVER ICE IN A SNOW AREA,
Civil Engineering Research Inst., Sapporo (Japan).
Y. Muraki, and S. Kamada.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Associatior for Hydraulic Research, Paper 3.3, 1970. 4 fig, 1 tab.

Descriptors: *Ice cover, *Snow, *Freezing, *Rivers, Frazil ice, Streamflow, Melting, Snow cover, Ice jams, Ice-water interfaces, Climatology.
Identifiers. Japan.

River ice in areas with heavy snow cover differs considerably from that in low temperature areas with little precipitation. River ice in those areas is characterized by a layer of slush sandwiched between layers of solid ice. Ice growth into the slush is a phenomenon independent of the thawing seen at the under surface of the river ice. When the water level is high, and wets the snow cover, the new layer of solid ice grows downward into the slush from the capillary potential level of water in snow. At the same time a new pair of layers of solid ice and slush becomes part of the river ice, and the river ice grows upward. (See also W72-09623) (Knapp-USGS)
W72-09637

MEASUREMENTS OF ICE ROUGHNESS AND THE EFFECT OF ICE COVER ON WATER LEVELS IN THREE NORWEGIAN RIVERS,
Norwegian Water Resources and Electricity Board, Oslo. Dept. of Hydrology.
E. Tesaker.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 3.4, 1970. 4 fig, 2 tab, 6 ref.

Descriptors: *Ice cover, *Roughness (Hydraulic), *Discharge (Water), *Streamflow, *Ice jams, Frazil ice, Rivers, Stage-discharge relations, Closed conduit flow, Manning's equation.
Identifiers: *Norway.

Ice damming and ice roughness were studied in three Norwegian rivers. Average ice roughness values were 0.013 to 0.020 (Manning's n). This is much less than the bed roughness, but still significant for the flow. The roughness of the ice cover on calm reaches varies from place to place. The roughness values vary from that of smooth river bed to glossy surfaces. No simple relationships seem to exist between bed and ice roughness or between ice damming and ice depth. (See also W72-09623) (Knapp-USGS)
W72-09638

THE MORPHLOGY AND PHYSICAL PROPERTIES OF PRESSURE RIDGES: BARROW, ALASKA, APRIL 1969,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. F. Weeks, and A. Kovacs.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 3.9, 1970. 9 fig, 5 ref.

Descriptors: *Ice cover, *Sea ice, *Pressure, Sea water, Topography, Salinity, Brines, Ice loads, Ice jams, Cold regions, Alaska, Water temperature.
Identifiers: *Pressure ridges (Sea ice).

Cross-sectional profiles, internal structures, temperatures, salinities and brine volumes were obtained from eight pressure ridges off Barrow, Alaska. Two of these ridges are described in detail and underwater photographs of the ridge keels are shown. Ridges form by either marginal 'crushing' or overthrusting. Lack of isostatic adjustment appears to be common. The degree of bonding between ice blocks in a ridge is related to the cold reserve of the blocks when they are incorporated into the ridge. The keels are commonly near melting temperatures. The repose angles of the upper and lower parts of ridges appear similar. (See also W72-09623) (Knapp-USGS)
W72-09639

THE STRUCTURE OF AN ICE RIDGE IN THE BALTIC,
Institute of Marine Research, Hlesinki (Finland).
E. Polosuo.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 3.10, 1970. 8 fig, 1 tab, 8 ref.

Descriptors: *Ice cover, *Sea ice, *Pressure, Sea water, Topography, Ice loads, Ice jams, Cold regions, Water temperature, Freezing, Melting.

Identifiers: *Baltic Sea.

Large ice ridges were studied in the Baltic. Their height above sea level is 1-2 meters and the submarine part is 6-10 meters deep, but in some cases depth can be as much as 20 meters. The dimensions seem to depend on the thickness of the ice from which the ridge has been formed. Pieces of ice on the surface will freeze together, but at a depth of 1-1.5 meters, the pieces are loose. (See also W72-09623) (Knapp-USGS)
W72-09640

ICE CONDITIONS IN THE THJORSA RIVER SYSTEM,
National Energy Authority, Reykjavik (Iceland).
S. Rist.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 3.11, 1970. 1 fig, 4 ref.

Descriptors: *Ice jams, *Frazil ice, *Hydroelectric plants, *Streamflow, Floods, Freezing, Rivers, Cold regions, Snowpacks, Glaciers, Turbulence.
Identifiers: *Iceland.

Ice conditions in the Thjorsa River system, Southern Iceland, are described. The Thjorsa River with its tributaries has the greatest power potential of all rivers in Iceland. Reaches of the river which remain open throughout the winter act as great frazil ice producers, causing ice jams as high as 15-18 m. The maximum rise in the water level occurs immediately below the section with the greatest slope. The Thjorsa drainage system covers 7,530 km, 16% covered with glaciers. The length of the river is 230 km. Average flow is 380 cu m/sec. Maximum floods observed are about 3,500 cu m/sec. They occurred during melting of snow accompanied by rain in a winter storm in March 1948, and during melting of snow in June 1949. At the Burfell powerplant the average flow is 340 cu m/sec but during prevailing periods of frost the flow is usually within the range of 110-170 cu m/sec. (See also W72-09623) (Knapp-USGS)
W72-09641

BREAK-UP AND CONTROL OF RIVER ICE,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
G. P. Williams.
In: Ice and its action on hydraulic structures, Proceedings of 1st International Symposium on Ice Problems, Sept 7-10, 1970, Reykjavik, Iceland: International Association for Hydraulic Research, Paper 3.12, 1970. 3 fig, 26 ref.

Descriptors: *Ice jams, *Ice breakup, *Flood control, *Rivers, Weather, Climatology, Channel morphology, Ice cover, Frazil ice, Freezing, Melting, Forecasting, Flood forecasting, Ice loads.
Identifiers: *Ice breakup control.

The process of river breakup and control of ice during breakup is reviewed. The main factors affecting breakup are briefly outlined. As the process of breakup depends on variable weather conditions and on local variations in channel morphology, breakup patterns vary from river to river and from year to year for a given section of river. The limitations and main problems associated with various control methods are summarized. Economic and local site conditions usually determine not only the method but also the extent to which river ice can be controlled. All methods of control have the basic requirement of being able to handle successfully the worst ice conditions likely to occur. Forecasting the different events associated with breakup is thus an important part of river ice control. (See also W72-09623) (Knapp-USGS)
W72-09642

WATER QUALITY RECORDS OF THE SNOWY MOUNTAINS REGION, AUSTRALIA.
Snowy Mountains Hydro-Electric Authority, Cooma (Australia).
For primary bibliographic entry see Field 07C.
W72-09770

CATALOGUE OF METEOROLOGICAL DATA OF THE SNOWY MOUNTAINS REGION, AUSTRALIA.
Snowy Mountains Hydro-Electric Authority, Cooma (Australia).
For primary bibliographic entry see Field 07C.
W72-09771

2D. Evaporation and Transpiration

ESTIMATING SOIL MOISTURE DEPLETION FROM CLIMATE, CROP AND SOIL DATA,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
For primary bibliographic entry see Field 02G.
W72-09223

WATER BUDGET ANALYSIS OF A NEW ENGLAND WETLAND,
New Hampshire Univ., Durham. Dept. of Soil and Water Science.
For primary bibliographic entry see Field 03B.
W72-09265

A COMPARISON OF MASS-TRANSFER AND CLIMATIC-INDEX EVAPORATION COMPUTATIONS FROM SMALL RESERVOIRS IN TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02H.
W72-09555

TOPOGRAPHIC EFFECTS APPARENT IN NOCTURNAL TEMPERATURE PROFILES IN A CONIFER CANOPY,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
J. D. Bergen.
Agricultural Meteorology, Vol 9, 1971/1972. p 39-50, 11 fig, 7 ref.

Descriptors: *Meteorology, *Heat balance, *Micrometeorology, *Topography, Heat transfer, Flow characteristics, Radiation, Atmospheric physics, Winds.

Vertical profiles of air temperature were measured through the canopy at a location on a forested mountain slope for two summer nights with light or no cloud cover, together with associated nocturnal sky radiation and windspeed. The temperature profiles show a local maximum well within the canopy. The behavior of this maximum on one of the nights with alternate cooling and warming on the slope indicated that it is due to subsidence heating caused by topographically induced divergence of the density flow in the canopy. The position and magnitude of the maximum are in approximate agreement with the estimated distribution of net radiation loss in the canopy and the measured windspeed. (Forest Service)
W72-09608

AN INEXPENSIVE HEATED THERMISTOR ANEMOMETER,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
J. D. Bergen.
Agricultural Meteorology, Vol 8, p 395-405, 1971. 7 fig, 1 tab, 9 ref.

Descriptors: *Anemometers, *Flow measurement, *Winds, Equipment, Micrometeorology, Flowmeters.
Identifiers: *Thermistor anemometer.

The inexpensive direct current heated thermistor anemometer described shows high sensitivity for low speeds such as found in plant canopies; errors due to turbulence are slight, but temperature corrections are required. Calibration data for 16 instruments show good agreement with that predicted by heat transfer theory. (Forest Service)
W72-09610

HEAT EXCHANGES AND FRAZIL FORMATION,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
For primary bibliographic entry see Field 02C.
W72-09633

COMPARISON OF EVAPORATIVE LOSSES IN VARIOUS CONDENSER COOLING WATER SYSTEMS,
Westinghouse Electric Corp., East Pittsburgh, Pa.
L. G. Hauser, and K. A. Oleson.
Proceedings of the American Power Conference, Vol 32, April 21-23, 1970. Illinois Institute of Technology, Chicago, p 519-527. 7 fig, 3 ref.

Descriptors: *Evaporation, *Cooling water, *Condensers, Heat transfer, Cooling towers, Humidity, Cloud cover, Wind speed, Temperature, Power plants, Heated water, *Consumptive use, Water utilization, Thermal pollution.
Identifiers: Cooling lakes, Spray ponds.

Water consumption by evaporation is a factor which largely has been ignored in past designs of cooling systems. The present rate of consumption is approximately 10 gallons per day per person at 1969 power generation rates. The rate of consumption, expressed as gallons per net KWH generated is examined as function of the variables involved in cooling system design. It is concluded that the lowest water consumption rate was found in the once-through natural lake or river. The next best consumption rate is produced by cooling towers or spray ponds, depending on site conditions. Cooling lakes have the highest water consumption rate. (Upadhyaya-Vanderbilt)
W72-09735

HEAT DISSIPATION AT POWER PLANT COOLING LAKES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography; and Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Engineering.
D. K. Brady.
Proceedings of the American Power Conference, Vol 32, April 21-23, 1970, Illinois Institute of Technology, Chicago, p 528-536. 6 fig, 1 tab, 3 ref.

Descriptors: Powerplants, *Evaporation, Efficiencies, Heated water, Vapor pressure, Intakes, Heat budget, Forecasting, *Water temperature, Cooling, Thermal pollution.
Identifiers: *Heat dissipation, Cooling lakes, Equilibrium temperature, Exchange coefficients.

Water temperatures in power plant cooling lakes may be satisfactorily predicted in terms of equilibrium temperature and the exchange coefficient. A design chart is available for estimating the exchange coefficient in terms of the dewpoint temperature and the wind speed. For most practical purposes, the equilibrium temperature may be satisfactorily estimated by adding to the dewpoint temperature the quotient of the gross solar radiation divided by the exchange coefficient. Cooling lake temperatures may be predicted by superimposing the results of five relatively independent evaluations of the long-term mean natural temperature, the diurnal temperature fluctuation, the spatial average temperature increment due to thermal load, the effect of mixing on the longitudinal profile of excess temperature and extreme temperature increments due to statistically infrequent meteorological conditions. (Upadhyaya-Vanderbilt)
W72-09736

CHANGED RESISTANCE OF ASPEN MESOPHYLL AS A RESPONSE TO RAPID LEAF DRYING, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
A. Laisk, and V. Oya.
Fiziol Rast. Vol 18, No 3, p 553-562. 1971. Illus. English summary.
Identifiers: *Leaves, Apparatus, Aspen D, Carbon, Concentration, Darkness, *Drying, Ivanov effect, Mesophyll, Oxide, Photosynthesis, *Resistance, Transpiration.

Gas exchange, transpiration and mesophyll resistance were studied in aspen leaves grown under natural conditions and then cut under water and kept in a leaf chamber of a 3-channel gasometric apparatus. Water supply to the leaf was interrupted by cutting the petiole. A simultaneous temporary rise in transpiration (the 'Ivanov effect') and in photosynthesis was observed, followed by a continuous decrease in the rates of both processes. The 'Ivanov effect' was observed also at a high CO2 concentration and in darkness. At that time the mesophyll resistance was constant or showed a small drop. In some cases the following decrease in the rate of photosynthesis was caused only by the stomatal closure, but sometimes also by a simultaneous increase of the mesophyll resistance. The latter was observed mainly with older leaves in Aug.--Copyright 1972, Biological Abstracts, Inc.
W72-09775

EFFECTS OF WATER DEFICIENCY ON TRANSFER OF ASSIMILATES FROM LEAVES INTO FRUIT ORGANS OF COTTON, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
For primary bibliographic entry see Field 03F.
W72-09776

RESPONSES OF STOMATA TO CHANGES IN HUMIDITY,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
O. L. Lange, R. Losch, E. D. Schulze, and L. Kappen.
Planta. Vol 100, No 1, p 76-86. 1971. Illus.
Identifiers: Air, Aperture, Diffusion, Epidermis, *Humidity, Leaf, Light, Microscopy, Photography, Polypodium vulgare P, Resistance, *Stomata, Transpiration, Valerianella locusta D.

Large areas of the lower epidermis of full-grown leaves of Polypodium vulgare (and Vulerianella locusta) are normally separated from the mesophyll by an extensive sub-epidermal airspace. Epidermal stripes were prepared for experiments to simulate these conditions in order to investigate stomatal reactions. They were placed with their inner surface in contact with an airspace of uniformly high humidity. The outer surface was treated with air of varying degrees of humidity. The stomatal reactions were observed by microscope and the opening of the guard cells determined photographically. Treatment of the outer side of the epidermis with dry air caused a rapid closing of the stomata, while moist air caused opening. This induction of opening and closing movements could be repeated up to 15 times with the same stoma by changing the degree of humidity. Neighboring groups of stomata showed different apertures according to their individual conditions. The degree of aperture of the stomata depended on the water potential of the ambient air and also on the humidity conditions in the subepidermal airspace. The cause of this stomatal behavior could lie in the 'peristomatal transpiration.' In this way, the guard cells are able to function as 'humidity sensors' which 'measure' the difference in water potential inside and outside the leaf. Their aperture thus is controlled by their individual transpiration conditions. This controlling mechanism could be very important for the water economy of plants. They would appear to be able to reduce their transpiration through an increase in diffusion resistance of the stomata during decreasing humidity in the ambient air, without changing the water status of the whole leaf.--Copyright 1972, Biological Abstracts, Inc.
W72-09783

THE WATER ECONOMY OF THE SEA GRASS THALASSIA TESTUDINUM,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 02L.
W72-09784

DAILY DYNAMICS OF TRANSPIRATION OF UPPER AND LOWER SIDES OF LEAVES IN SOME MONOCOTYLEDONOUS AND DICOTYLEDONOUS PLANTS, (IN UKRAINIAN),
Ukrainskii Nauchno-Issledovatelskii Institut Fiziologii Rastenii, Kiev (USSR).
V. Z. Kotlyar, M. V. Kotsur, and M. A. Lyubyns'Kyi.
Ukr Bot Zh. Vol 28, No 2, p 209-215. 1971. (English Summary).
Identifiers: Dicotyledonous plants, Epidermis, *Leaves, *Maize M, Monocotyledonous plants, Nutrition, Plants, Sides, Species, Stomata, Sugarbeet D, Tobacco D, *Transpiration.

The experiment showed differences in the daily transpiration rates of maize, sugar beets and tobacco plants. Generally, the upper side of these 3 plants transpired more slowly than the lower side. The exceptions were sugar beets and maize, which transpired at uneven rates. It was assumed that there was a difference in the water supply of upper and lower epidermis. The maize differences in transpiration along the leaf blades between the upper and lower sides were minimal in their middle parts. In tobacco the rates of transpiration of the upper side to that of the lower was less than in sugar beet and maize. In maize it changed considerably depending upon the nutrition supply.--Copyright 1972, Biological Abstracts, Inc.
W72-09785

2E. Streamflow and Runoff

SUMMARY OF FLOODS IN THE UNITED STATES DURING 1967,
Geological Survey, Washington, D.C.
J. O. Rostvedt.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.75. Geological Survey Water-Supply Paper 1880-C, 1972. 115 p, 48 fig, 33 tab, 24 ref.

Descriptors: *Floods, *Flood damage, *United States, *Annual flood, Reviews, Peak discharge, Streamflow, Flood plains, Stream gages, Flow measurement, Rainfall, Runoff, Hydrologic data.
Identifiers: Fifty-year flood.

The two most destructive floods in the United States during 1967 occurred in August in east-central Alaska and in September and October in southern Texas. In east-central Alaska, heavy rain on August 8-17 produced record-breaking floods near Fairbanks. Peak discharges on some streams in the area were from two to four times the 50-year flood. Flood damage was estimated to have been $85 million, and six lives were lost. Torrential rains produced by Hurricane Beulah caused record-breaking floods on many streams in a 50,000-square-mile area in southern Texas and northeastern Mexico in September and October. As much as 25.5 inches of rain was measured at ESSA Weather Bureau stations in the period September 19-25. Major flooding occurred in the basins of the Guadalupe, San Antonio, Mission, Aransas, and Nueces Rivers and in many small coastal basins in Texas; on the Rio Grande and its floodways; and in the Rio Alamo and Rio San Juan basins in Mexico. Peak discharges at several sites in Texas were more than three times the magnitude of a 50-year flood. Total damage in Texas due to wind, rain, stream flooding, sheet flow, ponding, and tidal flooding was $167 million. In addition to the two floods mentioned above, 27 others of lesser magnitude are considered important enough to be included in this 1967 flood summary. (Woodard-USGS)
W72-09222

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 2.--SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Washington, D.C.

Available free on application to USGS, Washington, D.C. 20242. Geological Survey Circular 652, 1972. 88 p, 1 fig.

Descriptors: *Surface waters, *Basic data collections, *Streamflow, *Gaging stations, *Documentation, Indexing, Reservoirs, Stream gages, Lakes, Streams, Drainage area, Crest-stage gages, Low flow.
Identifiers: *Surface-water records index, *South Atlantic slope basins, *Eastern Gulf of Mexico basins.

This index lists the streamflow and reservoir stations in the South Atlantic slope and eastern Gulf of Mexico basins for which records have been or are to be published in reports of the U.S. Geological Survey for periods through September 30, 1970. Also included are crest-stage and low-flow partial-record stations. (Woodard-USGS)
W72-09224

WATER RESOURCES INVESTIGATIONS IN LOUISIANA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09225

WATER RESOURCES INVESTIGATIONS IN IOWA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09226

HYDRO-PHYSIOGRAPHIC MODEL,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
For primary bibliographic entry see Field 06A.
W72-09234

ASYMPTOTIC THEORY OF HELICAL WAVES ON A GASEOUS JET IN A ROTATING VISCOUS FLUID,
Wisconsin Univ., Madison. Water Resources Center.
M. C. Shen.
Available from the National Technical Information Service as PB-209 943, $3.00 in paper copy, $0.95 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, 1971. 23 p, 3 fig, 8 ref. OWRR A-037-WIS (4).

Descriptors: *Waves (Water), *Flow, *Approximation method, *Free surfaces, *Mathematical models, Model studies, Fluid mechanics.
Identifiers: *Asymptotic theory, *Helical waves.

A nonlinear asymptotic theory within the framework of long-wave approximation is developed for the study of helical waves on a rotating viscous fluid with a cylindrical free surface, and the mathematical model considered is relevant to problems of geophysical significance. A unified approach to the derivation of asymptotic equations is achieved, and for the sake of practical application the range of validity of each equation is clearly stated in terms of physical scales. The theory also yields asymptotically without direct computation stability region for the wave motion,

hence suggests an effective method to deal with stability problems of viscous fluid flow with free surface.
W72-09237

STREAM TURBULENCE EFFECTS ON TURBULENT BOUNDARY LAYER,
Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
J. M. Robertson, and C. F. Holt.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY6, p 1095-1099, June 1972. 2 fig, 13 ref.

Descriptors: *Turbulence, *Turbulent flow, *Turbulent boundary layers, Laboratory tests, Model studies, Hydraulic models.
Identifiers: Wind tunnels.

Nearly all information on turbulent boundary-layer flow is for the case of rather low levels of turbulence in the free stream outside the layer. However, many situations of great technical interest occur with higher stream turbulence levels. A high level of stream turbulence is suggested as one of 10% or greater, in that this level is about equal to the largest intensity (in terms of free-stream velocity) found in the flat-plate turbulent layer. This study is limited to the intermediate (moderate) range of turbulence levels of 1% to 10%. Experiments were conducted on the development of the turbulent boundary layer on a flat plate held in a closed jet air tunnel with the turbulence intensity increased by a grid located upstream of the plate's leading edge. Velocity traverses were taken at various distances from the leading edge with a Pitot tube of 0.028 in. diam. at a free-stream speed generally of about 51 fps, although one series was taken at 100 fps. The effect of moderate stream turbulence levels is thus one of thickening the boundary layer and flattening the velocity profile. (Knapp-USGS)
W72-09257

STREAM TEMPERATURE PREDICTION UNDER REDUCED FLOW,
Bonneville Power Administration, Portland, Oreg.
For primary bibliographic entry see Field 04A.
W72-09259

A HYDROMETEOROLOGICAL DATA APPRAISAL AND DESIGN STUDY IN CERTAIN RIVER BASINS IN THE WESTERN UNITED STATES.
North American Weather Consultants, Goleta, Calif.
For primary bibliographic entry see Field 02B.
W72-09272

THEORETICAL ANALYSIS OF FLOW PAST LEAF GATE,
Manchester Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W72-09274

MULTIPURPOSE OPERATION STUDIES OF A CANAL-LAKE-RIVER SYSTEM--OSWEGO RIVER SYSTEM, NEW YORK,
New York State Dept. of Environmental Conservation, Albany. Bureau of Water Resources Planning.
For primary bibliographic entry see Field 04A.
W72-09287

TROUTS OF THE UPPER KERN RIVER BASIN, CALIFORNIA, WITH REFERENCE TO SYSTEMATICS AND EVOLUTION OF WESTERN NORTH AMERICAN SALMO,
Colorado Cooperative Fishery Unit, Fort Collins.
C. B. Schreck, and R. J. Behnke.
Journal of the Fisheries Research Board of Canada, Vol 28, No 7, p 987-998. 1971. Map.

Identifiers: *Kern River basin, California, Evolution, Salmo aguabonita aguabonita, Salmo aguabonita gilberti, Salmo roosevelti, Salmo rosei, Salmo whitei, *Systematics, *Trout, Cutthroat trout, Rainbow trout.

The five endemic species and subspecies of trout named from the upper Kern River drainage of the southern Sierras are revised to 2 subspecies of Salmo aguabonita: S. a. aguabonita and S. a. gilberti. Analysis of various characters led to the conclusion that S. a. aguabonita did not differentiate from a coastal rainbow trout as surmised by other workers. This conclusion was based on: morphological similarities with the inland cutthroat trout; apparent relationships with the Gila, Apache, and Mexican golden trouts of New Mexico, Arizona, and northern Mexico, respectively; a chromosomal complement identical to that of the Apache trout and more readily derived from that of S. clarki than from that of S. gairdneri; and geomorphogeny and zoogeography of the southern Sierras. This evidence suggests the golden trout represents an ancient form whose origin was associated with a widely distributed group of goldenlike trouts. The trout originally from the Kern River has a chromosome count and a chromosome arm number identical to those of S. a. aguabonita and therefore is classified as S. aguabonita gilberti. The Little Kern golden trout, S. whitei, is considered a synonym of S. a. gilberti. Similarities with an undescribed form of the McCloud-Pit drainage of northern California suggests a common ancestry. Today, S. a. gilberti is best represented by populations in the upper Little Kern watershed. S. roosevelti is considered a synonym of S. a. aguabonita and S. rosei most likely had a hybrid origin derived from introductions of S. a. gilberti and S. a. aguabonita.--Copyright 1972, Biological Abstracts, Inc.
W72-09515

WATER RESOURCES INVESTIGATIONS IN MISSISSIPPI, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09534

WATER RESOURCES INVESTIGATIONS IN MONTANA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09535

WATER RESOURCES INVESTIGATIONS IN KANSAS, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09536

CHARACTERISTICS OF STREAMFLOW AT GAGING STATIONS IN SHELL CREEK, ELKHORN RIVER, AND SALT CREEK BASINS, NEBRASKA,
Geological Survey, Lincoln, Nebr.
F. B. Shaffer.
Geological Survey Open-file Report 7204, April 1972. 79 p, 10 fig, 3 tab, 12 ref.

Descriptors: *Streamflow, *Gaging stations, Water supply, *Irrigation, *Nebraska, Water users, Flow rates, Pumping, Water yield, Groundwater, Withdrawal, Reviews, Hydrologic data, Basic data collections, Flood control, Lakes, Watershed management, Waste disposal, Wildlife conservation.
Identifiers: *Shell Creek (Nebr), Elkhorn River (Nebr), *Salt Creek (Nebr).

Streams in Nebraska have been gaged under a variety of State, Federal, and State-Federal cooperative programs, sporadically beginning in 1894 and continuously since 1931. Summarized are the statistical analyses made of streamflow at 2 gaging stations on Shell Creek, 9 on the Elkhorn River, and 10 on Salt Creek; all of which are tributary to the Platte River below Columbus, Nebraska. The streamflow data are presented in a form usable for planning irrigation projects, designing water-supply and waste-disposal systems, developing wildlife conservation programs, and evaluating the effect of water use on the water supply. Irrigation is the principal use of water that affects streamflow in the Shell Creek and Elkhorn River basins and also is important in the Salt Creek basin. An estimated 2,255 acres were irrigated with water pumped from Shell Creek in 1970. A total of about 538 cfs in rights to pump Elkhorn River for irrigation and 1,154 acre-feet to store in lakes were granted in the 1929-70 period. Approximately 7,720 acres were irrigated with surface water from Salt Creek in 1970. Estimated irrigation with groundwater in the three basins also is included. (Woodard-USGS)
W72-09556

ICE AND ITS ACTION ON HYDRAULIC STRUCTURES.
For primary bibliographic entry see Field 02C.
W72-09623

CHANGE OF VELOCITY DISTRIBUTION IN A CROSS-SECTION OF A FREEZING RIVER AND THE EFFECT OF FRAZIL ICE LOADING ON VELOCITY DISTRIBUTION,
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 02C.
W72-09636

A STUDY ON THE FORMATION OF THE RIVER ICE IN A SNOW AREA,
Civil Engineering Research Inst., Sapporo (Japan).
For primary bibliographic entry see Field 02C.
W72-09637

WATER TEMPERATURES OF CALIFORNIA STREAMS, SOUTH COASTAL SUBREGION,
Geological Survey, Menlo Park, Calif.
J. C. Blodgett.
Geological Survey Open-file Report, April 10, 1972. 71 p, 4 fig, 1 tab, 24 ref.

Descriptors: *Water temperature, *Streams, *California, *Basic data collections, Thermometers, Measurement, Monitoring, Sites, Water properties.
Identifiers: *South Coastal Subregion (Calif).

A summary of water-temperature records for 156 stream sites is presented for data collected through September 1968 in the South Coastal Subregion of California. Water temperatures, in degrees Celsius, are summarized by months, years, and for the period of record. A description is included to identify each station where data were collected. A tolerance interval analysis indicates that 99% of the point water-temperature observations, determined either with thermograph probes or hand-held thermometers, should be within plus or minus 0.8 deg C for periodic data to plus or minus 1.4 deg C for thermograph data. (Woodard-USGS)
W72-09755

ON THE CLASSIFICATION AND TRENDS OF LONG PERIOD SEA LEVEL SERIES,
National Ocean Survey, Rockville, Md.
For primary bibliographic entry see Field 07C.
W72-09757

BEACH WATER TABLE AND BEACH--PROFILE MEASURING EQUIPMENT,
Erindale Coll. (Ontario).
For primary bibliographic entry see Field 07B.
W72-09758

THE VIRGINIA FLOOD OF 1969,
Geological Survey, Washington, D.C.
D. B. Kelly.

Virginia Division of Water Resources Information Bulletin 505, 1971. 23 p, 39 fig, 2 tab.

Descriptors: *Floods, *Historic floods, *Flood damage, *Virginia, Rainfall, Hurricanes, Runoff.
Identifiers: *James River Basin (Va), Hurricane Camille (1969), 100-year flood.

Pictures and descriptions of the effects of the flood caused by Hurricane Camille in the James River basin of Virginia in 1969 are presented. In the wake of a 1,000-year rain, a 100-year flood, and landslides that reshaped slopes and valleys along a 40-square mile stretch of the Blue Ridge, 152 Virginians were killed or declared missing, including 1% of the population of Nelson County, hardest hit part of the State. The damaged land, buildings, and highways of Virginia totaled more than $116 million and much of the farmland may never be reclaimed from the mud and boulders. (Woodard-USGS)
W72-09760

WATER RESOURCES OF CLAY, GREENE, CRAIGHEAD, AND POINSETT COUNTIES, ARKANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09764

WATER RESOURCES INVESTIGATIONS IN MISSOURI, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09766

WATER RESOURCES INVESTIGATIONS IN NEW JERSEY, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09767

WATER RESOURCES INVESTIGATIONS IN MINNESOTA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09768

2F. Groundwater

WATER RESOURCES INVESTIGATIONS IN LOUISIANA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09225

WATER RESOURCES INVESTIGATIONS IN IOWA, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09226

GEOLOGY AND GROUND-WATER RESOURCES OF NORTHWESTERN NORTH CAROLINA,
North Carolina State Dept. of Water and Air Resources, Raleigh. Div. of Ground Water.
For primary bibliographic entry see Field 04B.
W72-09264

AVAILABILITY OF GROUND WATER FOR PUBLIC-WATER SUPPLY IN THE PENSACOLA AREA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W72-09267

GEOCHEMICAL STUDY OF THE GROUND WATER OF THE 'SABLES INFERIEURS' CONFINED AQUIFER, OF THE AQUITAINE BASIN (ETUDE GEOCHIMIQUE DE LA NAPPE DES 'SABLES INFERIEURS' DU BASSIN D'AQUITAINE),
Bordeaux Univ., Talence (France). Centre d'-Hydrogeologie.
M. Schoeller.
Journal of Hydrology, Vol 15, No 4, p 317-328, April 1972. 7 fig, 1 tab, 7 ref.

Descriptors: *Geochemistry, *Artesian aquifers, *Water chemistry, *Confined water, Hydrogeology, Water circulation, Water analysis, Groundwater movement.
Identifiers: France.

A geochemical study of a confined groundwater body shows how the hydrochemistry reflects the hydrodynamics and the recharge. The ratios of the different ions do not always characterize a family of waters. The best way is to utilize logarithmic graphs. They distinguish clearly not only the different sequences of anions and cations and the different families of water, but also the different hydrodynamic zones of an aquifer and the lithological facies. This was applied to a confined aquifer, the 'Sables inferieurs du Bassin d'Aquitaine'. (Knapp-USGS)
W72-09269

RURAL WATER SUPPLY IN THE BASEMENT COMPLEX OF WESTERN STATE, NIGERIA,
Ife Univ. (Nigeria). Dept. of Geology.
For primary bibliographic entry see Field 03B.
W72-09275

NATURAL ISOTOPES IN THE GROUNDWATER OF THE TULUM VALLEY, SAN JUAN, ARGENTINA,
Groningen Rijksuniversiteit (Netherlands). Physics Lab.
J. C. Vogel, J. C. Lerman, and W. G. Mook.
Hydrological Sciences Bulletin, Vol 17, No 1, p 85-96, April 1972. 5 fig, 3 tab, 19 ref.

Descriptors: *Groundwater movement, *Tracers, *Stable isotopes, *Radioisotopes, Oxygen isotopes, Aquifers, Hydrogeology, Aquifer characteristics, Areal hydrogeology, Faults (Geologic), Water resources development, Carbon radioisotopes.
Identifiers: *Tulum Valley (Argentina).

The groundwater in the Tulum Valley of Western Central Argentina is mainly recharged by water from the San Juan River. Both isotope and hydrogeological investigations of the region lead to this conclusion. A faulted buried ridge divides the valley into two basins. The northern section has deep groundwater that seems to be trapped by the upfaulted block. It has been shown by radiocarbon analyses that water from the upper aquifer flows with a velocity of 10 m/yr. South of the ridge the situation is more complicated; oxygen-18 and hydrogeological analyses indicate a contribution from local precipitation. (Knapp-USGS)
W72-09276

GROUNDWATER FLOW IN CALCAREOUS AQUIFERS IN THE VICINITY OF BARCELONA, SPAIN,
Groundwater Research Center, Jerusalem (Israel).
S. Mandel, Y. Gilboa, and A. Mercado.
Hydrological Sciences Bulletin, Vol 17, No 1, p 77-83, April 1972. 4 fig, 9 ref.

Descriptors: *Karst hydrology, *Saline water intrusion, *Karst, *Aquifers, *Groundwater movement, Aquifer characteristics, Limestones, Tracers, Stable isotopes, Deuterium, Oxygen isotopes, Carbonate rocks, Sinks, Water circulation.
Identifiers: *Barcelona (Spain).

Two Calcareous aquifers occur in the Garraf Range and the Gaya Block, 30 km southwest of Barcelona, Spain, which are faulted structures of Cretaceous Age. Groundwater flow is strongly influenced by karstic solution of the rocks, which has reached a more advanced stage of development in the lower aquifer in the Garraf Range. An almost direct hydraulic connection exists between sinkholes and large submarine springs. Flow directions in the upper aquifer are also strongly conditioned by karstic solution, but the karst is less developed and almost unconnected with the lower aquifer. Stable isotopes, deuterium, and oxygen 18 were used to determine the direction of travel of seepage losses from a surface reservoir. The circulation of groundwater is almost entirely confined to solution channels directed along structural lines and faults. The flow in these channels is, at least partly, of a turbulent character. The most promising areas for additional groundwater exploitation are inland, along the border fault lines. As far as 2-3 km inland, seawater intrusion considerably restricts the possibility of groundwater exploitation. Analyses of stable isotopes demonstrated conclusively that water losses from the Foix reservoir are caused by seepage into the Cretaceous aquifer. One solution of the problem would be to restrict the reservoir area so that all of it is situated on Miocene outcrops. (Knapp-USGS)
W72-09277

WATER RESOURCES INVESTIGATIONS IN MISSISSIPPI, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09534

WATER RESOURCES INVESTIGATIONS IN MONTANA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09535

WATER RESOURCES INVESTIGATIONS IN KANSAS, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09536

ADSORPTION OF LINDANE AND DIELDRIN PESTICIDES ON UNCONSOLIDATED AQUIFER SANDS,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 05B.
W72-09539

ELECTRICAL ANALOG MODEL STUDY OF WATER IN GUAYAMA AREA, PUERTO RICO: PHASE 1 -- ASSEMBLING DATA FOR THE ANALOG MODEL,
Geological Survey of Puerto Rico, San Juan.
J. R. Diaz.
Geological Survey Open-file Report, August 1971. 57 p, 9 fig, 4 tab, 1 ref.

Descriptors: *Hydrology, *Groundwater movement, *Water supply, *Water wells, *Puerto Rico, Aquifer characteristics, Water yield, Water quality, Groundwater recharge, *Analog models, Industries, Agriculture, Water users, Rainfall, Geology, Water levels, Hydrologic budget, Surface-groundwater relationships.
Identifiers: *Guayama (P.R.).

With the advent of heavy industry and the construction of an artificial harbor in the Guayama, Puerto Rico area, land use for agriculture in this analog model study area is decreasing and land use for industry is increasing. The reduction in irrigation for agriculture can have profound impact on groundwater storage and availability. There are three principal parts to the alluvial aquifer: the Guamani fan, west of Rio Guamani; the Guayama fan, east of Rio Guamani; and the alluviated valley northwest of Guayama. The Guamani fan is the

best source of water, and most of the large wells are located there. One well yields 1,120 gallons per minute, the highest known, but good wells more commonly yield 200 to 400 gpm. The Guayama fan is the poorest source of water because its alluvium is thinner than that in the Guamani fan, and tight soil overlying the Guayama alluvium inhibits recharge. The alluvium in the valley northwest of Guayama is thinner than that in the Guamani fan, but it is very porous and readily accepts recharge. The quality of water is good for most purposes, and there is no evidence of salt-water intrusion. (Woodard-USGS)
W72-09543

GROUND-WATER RESOURCES OF CACHE VALLEY, UTAH AND IDAHO,
Geological Survey, Logan, Utah.
For primary bibliographic entry see Field 04B.
W72-09558

GROUND-WATER LEVELS IN THE LOWER ARKANSAS RIVER VALLEY OF COLORADO, 1968-72.
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W72-09559

INFILL OF NUCLEAR RUBBLE CHIMNEYS BY GROUND WATER,
Teledyne Isotopes, Palo Alto, Calif. Palo Alto Labs.
For primary bibliographic entry see Field 04B.
W72-09617

MAPPING BURIED BEDROCK TOPOGRAPHY WITH GRAVITY,
East Texas State Univ., Commerce. Dept. of Earth Sciences.
A. Ibrahim, and W. J. Hinze.
Ground Water, Vol 10, No 3, p 18-23, May-June 1972. 8 fig, 6 ref.

Descriptors: *Subsurface mapping, *Gravity studies, *Subsurface investigations, *Topography, *Aquifers, Geophysics, Gravity, Aquifer characteristics, Central U.S., Glacial drift, Groundwater.
Identifiers: *Bedrock topography.

In the Midwest, bedrock formations commonly are denser than overlying glacial sediments. Thus gravity anaomalies have a direct relationship to bedrock topography. Where the density contrast between the glacial sediments and the bedrock is known, the anomalies can be used to map the bedrock configuration if they can be isolated from deeper gravity anomalies. A method of isolating bedrock topography gravity anomalies is based upon known bedrock elevations obtained from drillhole data. A regional gravity anomaly map is prepared by subtracting the excess gravitational effect of the known bedrock relief from the observed gravity anomalies. The regional gravity anomaly map is subtracted from the observed anomaly map to obtain a residual anomaly map reflecting the bedrock topography. The bedrock configuration can be calculated directly from this map. This method was found to be superior to the use of cross-profiling and least-squares polynomial approximation procedures in a study of Kalamazoo County, Michigan. (Knapp-USGS)
W72-09618

GROUND-WATER VOLUMES FROM ANOMALOUS MASS DETERMINATIONS FOR ALLUVIAL BASINS,
Arizona Univ., Tucson. Geophysics Lab.
R. E. West, and J. S. Sumner.
Ground Water, Vol 10, No 3, p 24-32, May-June 1972. 6 fig, 3 tab, 18 ref. NSF Grant GA-26104.

Descriptors: *Gravity studies, *Subsurface mapping, *Aquifers, *Alluvium, Subsurface investigations, Aquifer characteristics, Water resource development, Groundwater, Data collections, Data processing, Mathematical models, Arizona.

Gravity data and geological information available from intermontane basins may be used to calculate volume of saturated sediments, volume of groundwater available from storage, and the total volume of groundwater. An anomalous mass occurs because of a density contrast which exists between low density alluvium and high density bedrock which define the surface and subsurface boundaries of the basin. The anomalous mass is uniquely determined by applying Gauss's theorem to the residual gravity map. A model of an intermontane basin relates the anomalous mass to the total volume of saturated sediments. The total volume of saturated sediments is determined from the anomalous mass, the density contrasts between unsaturated and saturated alluvium and bedrock, the area of the basin, and the water table depth. The method is illustrated by a case history from Avra Valley, Arizona. The major advantage of this method occurs when well data are not available, because is eliminates the need for arbitrary assumptions about subsurface basin geometry to determine the volume of saturated sediments. (Knapp-USGS)
W72-09619

NITROGEN THERMAL WATERS OF THE USSR (AZOTNYYE TERMY SSSR),
Tsentralnyi Nauchno-Issledovatelskii Institut Kurortologii i Fizioterapii, Moscow (USSR).
L. N. Barabanov, and V. N. Disler.
'Geominvod', Moscow, 1968. 120 p.

Descriptors: *Thermal water, *Thermal springs, *Mineral water, *Nitrogen, *Water types, Water utilization, Water properties, Water chemistry, Chemical analysis, Gases, Ions, Trace elements, Radioactivity, Hydrogeology, Aquifers, Rocks, Public health, Human diseases, Hydrothermal studies, Geographical regions.
Identifiers: *USSR, *Balneology, *Balneotherapy, *Spas, Mineralization, Tectonics.

The distriburion, physicochemical composition, and properties of weakly mineralized, nitrogen thermal waters of the USSR are described. Typical deposits of nitrogen thermal waters in granites, sedimentary, and volcanogenic-sedimentary rocks are examined in connection with the importance of these waters for thermal power and balneotherapy. Detailed chemical analyses of thermal waters and their medicinal use in the treatment of disease at health resorts are outlined in separate appendices. (Josefson-USGS)
W72-09645

GROUNDWATER AND DRAINAGE-WATER MINERALIZATION IN THE MUGAN-SAL'YANY REGION (MINERALIZATSIYA GRUNTOVYKH I DRENAZHNYKH VOD MUGANO-SAL'YANSKOGO MASSIVA),
Azerbaidzhanskii Politekhnicheskii Institut, Baku (USSR).
For primary bibliographic entry see Field 04B.
W72-09750

NUMERICAL METHODS FOR DETERMINING STREAMLINES AND ISOPRESSURES FOR USE IN FLUID-FLOW STUDIES,
San Francisco Energy Research Lab., Calif.
R. V. Higgins, and A. J. Leighton.
Bureau of Mines Report of Investigations 7621, 1972. 60 p, 9 fig, 14 tab, 9 ref, 2 append.

Descriptors: *Groundwater movement, *Numerical analysis, *Flow profiles, *Underground streams, *Computer models, Fluid mechanics, Methodology, Analytical techniques, Isobars, Oil reservoirs, Input-output analysis, Equations, Computer programs, Model studies, Hydraulic models, Aquifer characteristics.
Identifiers: Isopressure, Fluid flow, Streamlines.

A numerical method is presented to calculate the isopressure (isobar) lines and streamlines for an oilfield from the pressure distribution. A knowledge of these lines is useful in the study of the flow of fluids in underground reservoirs, especially for those containing gaseous and/or liquid hydrocarbons. This work was done primarily to enable determination of the shape factors needed in the calculation of petroleum reservoir performance. However, it has application for the flow of water in aquifers, or electricity or heat in odd-shaped geometry. Techniques previously developed were used to calculate the pressure distribution. From this pressure distribution, the isopressure lines were calculated. Then by successively projecting orthogonal lines from one isopressure line to another, the streamlines are determined. From the coordinates of the isopressures and the streamlines, the shape factors can be determined by a published method. Computer methods are presented to calculate the streamlines and isopressures for any well-spacing pattern existing within a field with multiple wells. The method reproduces the flow net for several well configurations having extensive geometrical variations. (Woodard-USGS)
W72-09754

USE OF GROUNDWATER FOR IRRIGATION IN CLAY COUNTY, NEBRASKA, 1970,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 04B.
W72-09756

WATER RESOURCES OF CLAY, GREENE, CRAIGHEAD, AND POINSETT COUNTIES, ARKANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09764

ANALYSIS OF THE GROUND-WATER SYSTEM BY ELECTRICAL-ANALOG MODEL, AVRA VALLEY, PIMA AND PINAL COUNTIES, ARIZONA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09765

WATER RESOURCES INVESTIGATIONS IN MISSOURI, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09766

WATER RESOURCES INVESTIGATIONS IN NEW JERSEY, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09767

WATER RESOURCES INVESTIGATIONS IN MINNESOTA, 1969.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-09768

GROUND-WATER HYDRAULICS,
Geological Survey, Washington, D.C.
S. W. Lohman.
Available from GPO, Washington, D.C. 20402 Price $2.00. Geological Survey Professional Paper 708, 1972. 70 p, 47 fig, 9 plate, 19 tab, 116 ref.

Descriptors: *Hydrogeology, *Groundwater movement, *Water yield, *Water wells, *Aquifer testing, Drawdown, Permeability, Hydraulic conductivity, Porosity, Safe yield, Aquifer characteristics, Unsteady flow, Steady flow, Saturated flow, Unsaturated flow, Artesian aquifers, Confined water, Hydraulics.
Identifiers: *Groundwater hydraulics.

The worth of an aquifer as a source of water depends largely upon two inherent characteristics--its ability to store and to transmit water. Thorough knowledge of the geologic framework is essential to understand the operation of the natural plumbing system within it. Groundwater hydraulics is concerned with the natural or induced movement of water through permeable rock formations. The principal method of analysis in groundwater hydraulics is the application, generally by field tests of discharging wells, of equations derived for particular boundary conditions. The essence of many of these is presented and briefly discussed. Nine plates and three figures of type-curves are reproduced at scales to fit readily available logarithmic or semilogarithmic translucent graph paper, and most of the data plots also are reproduced at scales to fit the proper type-curves. All the given type-curves may be used in the solution of actual field problems. (Knapp-USGS)
W72-09769

2G. Water in Soils

A TEST OF THE UNIQUENESS OF THE SOIL MOISTURE CHARACTERISTIC DURING TRANSIENT, NONHYSTERETIC FLOW OF WATER IN A RIGID SOIL,
Sydney Univ. (Australia). Dept. of Soil Science.
D. E. Smiles, Michel Vauclin, and Georges Vachaud.
Soil Science Society of America Proceedings 35 (4): 534-539. 1971. Illus.

Descriptors: *Soil moisture, Diffusion, Flow, Soils, Sorption.

Simultaneous and nondestructive measurements of water content and potential at a number of points in a horizontal column of rigid sand indicate that during desorption the moisture characteristic is not unique throughout the column. The effect does not appear to be hysteretic, nor does it arise because of inhomogeneity in the column or inadequate ventilation. The effect was not observed during sorption.--Copyright 1972, Biological Abstracts, Inc.
W72-09183

ESTIMATING SOIL MOISTURE DEPLETION FROM CLIMATE, CROP AND SOIL DATA,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
M. E. Jensen, J. L. Wright, and B. J. Pratt.
American Society of Agricultural Engineers Transactions, Vol 14, No 5, p 954-959, September-October 1971. 2 fig, 33 ref.

Descriptors: *Irrigation programs, *Computer programs, *Soil moisture, *Irrigation efficiency, *Water requirements, Soil-water-plant relationships, Water management (Applied), Evapotranspiration.
Identifiers: Irrigation scheduling.

One of the greatest potential applications of evapotranspiration technology is in the management of irrigation farms. User-oriented methodology was developed to provide additional information to the irrigation farm manager. The procedure is based on estimating soil moisture depletion from climate, soil and crop data. Estimates of soil moisture depletion are provided for each field for each day of the growing season. Estimates of daily depletions of soil moisture within 10 percent or possibly 15 percent, which usually results in better accuracy over 10- to 20-day periods, are adequate. As a result, the timing of an irrigation will be within 1 day with 10-day frequencies or 2 to 3 days for 20- to 30-day frequencies. (Knapp-USGS)
W72-09223

WATER TABLE DRAWDOWN AROUND AN OPEN DITCH IN ORGANIC SOILS,
North Central Forest Experiment Station, Grand Rapids, Minn. Northern Conifers Lab.
For primary bibliographic entry see Field 04A.
W72-09268

TWO- AND THREE-DIMENSIONAL INFILTRATION: SEEPAGE FROM IRRIGATION CHANNELS AND INFILTROMETER RINGS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
For primary bibliographic entry see Field 04A.
W72-09270

AVAILABLE SOIL WATER: TIME-DISTRIBUTION IN A WARM SEASON RANGELAND,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02A.
W72-09271

SOIL NITROGEN CYCLE--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from NTIS, Springfield, Va. 22151 as PB-209 931, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center WRSIC 72-208, April 1972. 288 p.

Descriptors: *Nitrogen cycle, *Soil gases, *Bibliographies, *Abstracts, Information retrieval, Digital computers, Publications, Ammonia, Farm wastes, Fertilizers, Soil chemistry, Water pollution sources, Leaching, Irrigation practices, Nitrates, Organic matter.

The bibliography contains 201 abstracts with full citation details for selected reports, journal articles, and various documents dealing with the soil nitrogen cycle published mostly since 1965. A majority of the documents are concerned with nitrogen in the soil as a water pollutant from such sources as surface water runoff, farm wastes, etc. Compiled from a computerized information base containing 35,675 abstracts at search time, the bibliography is representative of the subject material contained in the journal 'Selected Water Resources Abstracts' through December 15, 1971 (Volume 4, Number 24). A comprehensive index is given that represents all the descriptors and identifiers used to index the various papers and documents represented by the abstracts in the bibliography. The abstracts are arranged in ascending WRSIC Accession Number sequence. (Lang-USGS)
W72-09299

THE DETERMINATION OF LEAD AND CADMIUM IN SOILS AND LEAVES BY ATOMIC ABSORPTION SPECTROSCOPY,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 05A.
W72-09331

BIOGEOCHEMICAL SOURCES OF IODINE AND COBALT IN MOLDAVIA (BIOGEOKHIMICHESKIYE PROVINTSII YODA I KOBALTA V MOLDAVII),
Kishinev Botanical Garden (USSR).
For primary bibliographic entry see Field 02K.
W72-09643

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, SANDOVAL AND LOS ALAMOS COUNTIES,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09658

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, CHAVES COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09659

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, GRANT COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09660

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, MORA COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09661

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, DE BACA COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09662

LAND CLASSIFICATION FOR IRRIGATION, ROOSEVELT COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09663

LAND CLASSIFICATION FOR IRRIGATION, TORRANCE COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09664

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, QUAY COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09665

EMANATIONS FROM SOIL AS A FUNCTION OF MOISTURE CONTENT (ZAVISIMOST' EMANIROVANIYA POCHV OT VLAZHNOSTI),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
N. G. Morozova, and I. A. Mukhraneli.
Pochvovedeniye, No 9, p 85-90, September 1971. 2 fig, 1 tab, 10 ref.

Descriptors: *Soil chemistry, *Soil gases, *Moisture content, Soil types, Loam, Calcareous soils, Pores, Variability, Analytical techniques, Equipment.
Identifiers: *USSR, *Estonian SSR, *Soil emanations, *Radon, *Thoron, Soil air, Hygroscopicity.

Loam and Sod-Calcareous sandy soil of the Estonian SSR were studied for changes in the coefficients of radon and thoron emanations at moisture contents from 0 to 40%. Variations in emanation coefficients follow a pattern identified with soil moisture contents of 0% (absolutely dry soil); 5%-10% (air-dry soil) to 20%; 20%-30%; and greater than 30%. The sharpest increase in radon and thoron values occurs when soil moisture content changes from the absolutely dry to air-dry state or maximum hygroscopicity of the soil. In the 5%-10% moisture range, the emanation coefficient increases slightly. For radon, the value of the emanation coefficient is constant when moisture contents are 5%, 10%-30%, AND 40%, and for thoron when moisture contents are 5%, 10%-20%,

and 25%. A decrease in emanation coefficients at moisture contents of > 25% and 30% is related to filling of soil pores with water. Changes in radon emanation coefficients are gradual and those of thoron, jumplike. Chemical inertness of radon and thoron and constancy of radon and thoron values at normal moisture content make them valuable indicators in studies of C02 liberation from soil. The 'breathing' regime of soil can be determined to a depth of 3 m on the basis of radon/thoron relations in soil air at moisture contents ranging between 5% and 20%. (Josefson-USGS)
W72-09742

OXIDATION-REDUCTION CONDITIONS IN IRRIGATED SOILS OF THE TASHKENT OASIS (OB OSOBENNOSTYAKH OKISLITEL'NO--VOSSTANOVITEL'NYKH USLOVIY OROSHAYEMYKH POCHV TASHKENTSKOGO OAZISA),
Ministerstvo Selskogo Khozyaistva Uzbek SSR, Tashkent. Institut Pochvovedeniya.
For primary bibliographic entry see Field 03F.
W72-09743

CHANGE IN PROPERTIES OF CHERNOZEMS OF THE DNEPROPETROVSK OBLAST AS A RESULT OF EROSION (IZMENENIYE SVOYSTV CHERNOZEMOV DNEPROPETROVSKOY OBLASTI V REZUL'TATE EROZII),
N. F. Benedichuk, and V. M. Krut'.
Pochvovedeniye, No 9, p 18-22, September 1971. 6 tab, 4 ref.

Descriptors: *Soil science, *Soil properties, *Soil erosion, *Erosion control, *Chernozems, Fertility, Soil density, Bulk density, Porosity, Permeability, Moisture content, Wilting point, Water storage, Humus, Nutrients, Nitrogen, Phosphorus, Farms.
Identifiers: *USSR, *Dnepropetrovsk Oblast, *Water erosion, *Erodibility.

Agrochemical and hydrophysical soil studies were conducted on key farm plots in the Dnepropetrovsk Oblast in 1965-1970 to find better ways of controlling water erosion and of increasing productivity of eroded soils. The soil cover consisted of moderately thick, medium loam Ordinary Chernozems with low humus content. The humus horizon in slightly eroded Chernozem was 5-13 cm thinner than in uneroded Chernozem and was practically nonexistent in moderately and severely eroded Chernozems. The nutrient content in moderately and severely eroded soils was 1.2-2 times less than that in uneroded soils. Density of Chernozems increased with increase in erodibility, while their porosity, water permeability, and total and available moisture contents decreased. (Josefson-USGS)
W72-09744

MOISTURE VARIATIONS IN A MODEL SOD--PODZOLIC SOIL (O NEKOTORYKH ZAKONOMERNOSTYAKH VAR'IROVANIYA VLAZHNOSTI V MODEL'NOY DERNOVO-PODZOLISTOY POCHVE),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
N. S. Oreshkina.
Pochvovedeniye, No 9, p 91-99, September 1971. 3 fig, 4 tab, 11 ref.

Descriptors: *Soil physics, *Soil moisture, *Moisture content, *Podzols, Soil profiles, Soil structure, Soil properties, Soil water, Hygroscopic water, Wilting point, Water loss, Spring, Summer, Dry seasons, Variability, Probability, Model studies, On-site investigations.
Identifiers: *USSR, *Moscow Oblast, *Sod-Podzolic soils, Hygroscopicity.

Field experiments were carried out in 1965-69 in the Lenin Hills near Moscow to study the relation of soil moisture variations to moisture content, depth, and makeup of soil horizons and rate of soil water loss. Variations in moisture content of the upper 3 genetic horizons of a model Sod-Podzolic soil obey the law of normal distribution, the moisture content differences between horizons being minimal in spring and considerable in summer. To obtain the average moisture content with an accuracy of 90% (P=0.95), determinations must be replicated 4-5 times for the A plow horizon, 3-4 times for the B sub 1 horizon, and 3 times for the B sub 2 horizon in spring and 13-14, 7-8, and 3-4 times, respectively, in summer. (Josefson-USGS)
W72-09748

MOISTURE CONTENT OF HUMMOCKY SANDS UNDER PINE PLANTINGS IN THE MIDDLE DON REGION (VLAZHNOST'-BUGRISTYKH PESKOV POD SOSNOVYMI NASAZHDENIYAMI NA SREDNEM DONU),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Agrolesomelioratsii, Moscow (USSR).
N. S. Zyuz'.
Pochvovedeniye, No 9, p 100-107, September 1971. 2 fig, 3 tab, 10 ref.

Descriptors: *Soil physics, *Soil moisture, *Moisture content, *Sands, *Pine trees, Root zone, Moisture availability, Moisture deficit, Groundwater, Water storage, Water loss, Surface runoff, Snowmelt, Melt water, Precipitation (Atmospheric), Topography, Soil profiles, Impervious soils, Blowouts, Seasonal.
Identifiers: *USSR, *Don River, *Hummocks, Deflation basins.

Investigations were conducted in 1965-67 in the region of the Middle Don to study the dynamics of water in medium to fine quartz hummocky sands under a stand of 51- to 54-year-old pine. Redistribution of precipitation through surface runoff plays an important part in the water regime of the sands. As much as two-thirds of the melt water runs off aeolian hummocks, where a periodic evapotranspiration type of water regime is formed. The amount of water, which collects in deflation basins, is 1.5-2 times the total annual precipitation, and most of it replenishes the groundwater supply. When impervious horizons are deep, this water becomes unavailable to trees. For sands of the Middle Don, this represents an annual water loss of about 500-1,000 cu m/ha. (Josefson-USGS)
W72-09749

EFFECTS OF IRRIGATION ON SALT REGIME OF DARK-CHESTNUT TERRACE SOILS IN THE TRANSVOLGA REGION (VLIYANIYE OROSHENIYA NA SOLEVOY REZHIM TERRASOVYKH TEMNO-KASHTANOVYKH POCHV ZAVOLZH'YA),
For primary bibliographic entry see Field 03F.
W72-09751

EFFECT OF ELEVATION AND RAINFALL ON THE PHYSICOCHEMICAL PROPERTIES OF THE SOILS OF THE HIGH RANGES OF KERALA,
Central Rice Research Station, Shoranur (India).
K. Nair, and M. M. Koshy.
Agr Res J Kerala. Vol 8, No 1, p 29-38. 1970.
Identifiers: Clay, Distribution, *Elevation, Kerala (India), Leaching, Minerals, *Rainfall, Ranges, *Soil properties, Translocation.

The surface horizon generally contains the maximum amount of clay which decreases with depth down the profile. The translocation of clay is maximum in soils at an elevation of 1200 m where rainfall and soil acidity are highest. Significant positive correlation exists between elevation and C and N contents. The surface soils generally show a higher content of P than the corresponding sub-soil. Positive correlation exists between the P content and organic matter in the soil from elevations of 600-1500 m. The sesquioxides are leached downwards from the surface soils at all elevations except in the soils at 1800-2100 m. The Ca content is highest in surface soils; it decreases down the profile at all elevations. The Mg content of the soil is inversely proportional to rainfall. The 1200-m elevation is critical, most of the soil properties being either maximum or minimum at this elevation.--Copyright 1972, Biological Abstracts, Inc.
W72-09774

INFLUENCE OF SOIL WATER MATRIC POTENTIAL AND HYDRAULIC CONDUCTIVITY ON THE GERMINATION OF RAPE (BRASSICA NAPUS L.),
University of the South Pacific, Suva (Fiji). School of Natural Resources.
For primary bibliographic entry see Fi . 03F.
W72-09780

2H. Lakes

WATER POLLUTION IN DELHI LAKES,
Delhi Univ. (India). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-09175

CAUSES OF NUMBER VARIATION IN REPLENISHMENT OF THE KAKHOVKA RESERVOIR CARP SCHOOL, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
S. P. Ozinkovskaya.
Gidrobiologicheskii Zhurnal 6 (3): 112-115. 1970.

Descriptors: Biomass, *Carp, Fish populations, Zooplankton, Fish food organisms, Larvae.
Identifiers: Kakhovka Reservoir (USSR).

The population of the generations of Azov kilka (tiulka) is determined finally between prelarval and larval stages. In this period latent anomalies preventing the transfer of larvae to active feeding occur. The concentration and accessibility of nutrient organisms is important. The relation of variations in the biomass of zooplankton and the number of larvae was confirmed. During evaluation of the tendency for variations in reserves, the age distribution of the school, changes in the size of the annual brood and the number of larvae must be considered.--Copyright 1972, Biological Abstracts, Inc.
W72-09202

EFFECTS OF SOUTH SHORE DRAINAGE BASINS AND CLAY EROSION ON THE PHYSICAL AND CHEMICAL LIMNOLOGY OF WESTERN LAKE SUPERIOR,
Wisconsin Univ., Madison. Water Resources Center.
D. A. Bahnick, A. B. Dickas, J. W. Horton, and R. K. Roubal.
Available from the National Technical Information Service as PB-209 896. Wisconsin Water Resources Center, Madison. Technical Completion Report, 1972. 35 p, 2 fig, 7 tab, 17 ref. OWR A-034-WIS (1).

Descriptors: Water quality, *Sediment distribution, *Erosion, *Clays, *Discharge (Water), *Nitrogen, *Phosphorus, *Iron, *Turbidity, Lakes, Wisconsin, *Lake Superior, *Bottom sediments, Lake sediments, *Drainage effects.
Identifiers: *Pleistocene red clay.

The study area extends from Superior, Wisconsin, to Amnicon Point, Wisconsin, a distance of eight miles. Sampling was enacted on lake waters from the shoreline out to a distance of one mile. This region of the lake receives extensive amounts of Pleistocene red clay due to erosion and is subject to discharge from bordering streams and from the Duluth-Superior harbor. Additional studies were made at a deep water site located five miles out from the shoreline of the study area. Water samples were obtained under conditions of varying turbidity of the waters (varying amounts of

suspended solids). The waters in the study area varied in amounts of suspended solids from 3 to 60 ppm as compared to 0.2 to 0.5 ppm found in the open waters of Lake Superior. Calcium, hardness, and alkalinity under specific conditions of the waters in the study area were higher when large amounts of suspended solids were present. Iron and total phosphate concentrations are high in the study area (with a direct correlation between the two parameters) as compared to open lake waters. The concentrations of iron and phosphate are particularly high in the early summer. Bottom sediment samples in the study area indicate fine sands predominate (0.25 to 0.125 mm in diameter), with the normal spread extending from coarse sand through the lower limits of very fine sand. In fact, no clearly established clay or mud bottom was recognized during the entire field sampling session. The principal source of suspended clay is from drainage waters eroding red clay containing basins and from storm wave action along the Valders Clay outcrops.
W72-09238

NEW GENETIC TYPE OF TIN PLACERS IN THE NORTHEASTERN YAKUTSK ASSR (NOVYY GENETICHESKIY TIP OLOVONOSNYKH ROSSYPEY V SEVERO--VOSTOCHNOY YAKUTII),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Mineralnogo Syrya, Moscow (USSR).
For primary bibliographic entry see Field 02J.
W72-09283

GEOLOGIC AGE OF ANCIENT LAKE SEDIMENTS OF THE MOLOGO-SHEKSNA DEPRESSION (O GEOLOGICHESKOM VOZRASTE DREVNEOZERNYKH OTLOZHENIY MOLOGO-SHEKSNINSKOY NIZINY),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 02J.
W72-09284

GREAT LAKES HYDROLOGY BY MONTHS, 1946-1965,
Illinois Univ., Urbana. Water Resources Center.
D. M. A. Jones, and D. D. Meredith.
Available from the National Technical Information Service as PB-209 930, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 53, 1972. 59 p, 5 fig, 20 tab, 26 ref. OWRR B-035-ILL (2).

Descriptors: *Great Lakes, *Precipitation, *Hydrologic budget, Evaporation, *Runoff forecasting, Water balance, *Lakes, *Isohyets, *Estimating, Lake basins, Water supply.
Identifiers: *Isopleth mapping.

Monthly estimates of precipitation on each lake, evaporation from each lake surface, and runoff into each lake from surrounding land areas are developed for the Great Lakes for calendar years 1946 through 1965. Overlake precipitation is estimated by extrapolation of the land isohyetal patterns multiplied by lake-land ratios as established from island-shore stations. Evaporation by months is calculated using the mass transfer method. An isopleth mapping technique is used to estimate the runoff. The net basin supply for a lake is equal to the total runoff plus the precipitation on the lake surface minus the evaporation from the lake surface. The monthly and annual net basin supplies for each lake are determined from the estimated values of runoff, precipitation, and evaporation and are compared with the monthly and annual net basin supplies as reported by the Army Coprs of Engineers. The estimated 20 year mean annual net basin supply for all lakes is about 6 percent less than the value reported by the Army Corps of Engineers.
W72-09298

DIURNAL UPTAKE OF NO3 AND NH4 BY A CERATOPHYLLUM-PERIPHYTON COMMUNITY,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-09406

ENVIRONMENTAL CONTROL OF THE ABUNDANCE AND DISTRIBUTION OF THE CHYDORID CLADOCERA,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
C. A. Goulden.
Limnology and Oceanography, Vol 16, No 2, p 320-331, 1971, Illus.
Identifiers: Abundance, Chydorid, *Crustaceans, Distribution, *Midges, *Population, Seasonal, Tanypodine, Aquatic life, *Environmental control.

Littoral populations of chydorid Cladocera were studied in 1968 and 1969 at 3 collection areas in Lake Lacawac, Pennsylvania. The station on the sandy leeward margin of the lake had peak populations in spring, the one on the detritus rich windward shore peaked in late summer and fall, and the one at the interface between the sandy and detritus-rich shores had peak populations in both spring and fall. At all areas the chydorids were least abundant in summer. There appeared to be ample food available in summer; chydorids were still able to reproduce after water temperatures had reached the summer maximum; and potential competitor species did not increase as chydorids decreased. Observations indicated that the summer population minimum was largely caused by predaceous tanypodine midges. The midges were most common, and the number of chydorids in their guts increased just before major chydorid population declines. The midges were rare or absent in spring and fall when chydorids were most abundant. Eight spp. of tanypodines were found in the lake. Three were common from mid-May to June; the others occurred in July. The first pulse of midges in June devastated the chydorid populations. The second pulse appeared only after the chydorids had recovered and began to develop large populations.--Copyright 1972, Biological Abstracts, Inc.
W72-09458

A COMPARISON OF MASS-TRANSFER AND CLIMATIC-INDEX EVAPORATION COMPUTATIONS FROM SMALL RESERVOIRS IN TEXAS,
Geological Survey, Austin, Tex.
R. O. Hawkinson.
Texas Water Development Board, Austin, Report 141, February 1972. 10 p, 4 fig, 3 tab, 13 ref.

Descriptors: *Evaporation, *Reservoirs, *Mass transfer, *Texas, Analytical techniques, Correlation analysis, Methodology, Climatic data, Hydrologic budget, Energy budget, Evaporation pans, Data collections, Winds, Temperature, Humidity, Instrumentation, Forecasting, Mathematical studies.
Identifiers: Computations.

The mass-transfer method of determining evaporation is utilized as the control method in an evaluation of climatic-index evaporation data provided by the Texas Water Rights Commission for eight floodwater-retarding reservoirs in Texas. Data were collected at each reservoir at various times during the period 1960-68 by the U.S. Geological Survey. A t-test for the comparison of means of two sets of independent observations was used to determine if a significant difference existed between monthly evaporation rates for bimonthly periods beginning with January as computed by the mass-transfer method and by the climatic-index method. No significant difference at the 5 percent level was found between the two sets of data during any of the 2-month periods. Exclusion of the inconsistent Calaveras Creek data increased the correlation coefficient between mass-transfer and climatic-index evaporation data from 0.81 to 0.86. Both methods are assumed to provide an equally good estimate of evaporation from small reservoirs. (Woodard-USGS)
W72-09555

EMERGENCE OF CADDISFLIES (TRICHOPTERA) AND MAYFLIES (EPHEMEROPTERA) FROM HEMING LAKE, MANITOBA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05C.
W72-09570

NITROGEN FIXATION BY BACTERIA IN LAKE MIZE, FLORIDA, AND IN SOME LACUSTRINE SEDIMENTS,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05C.
W72-09579

RIVER AND LAKE ICE TERMINOLOGY,
Foundation of Canada Engineering Corp. Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 02C.
W72-09625

TEMPERATURE GRADIENTS IN A LAKE ICE COVER,
Queen's Univ., Kingston (Ontario).
For primary bibliographic entry see Field 02C.
W72-09630

PROBLEMS IN WATER TOXICOLOGY (VOPROSY VODNOY TOKSIKOLOGII).
For primary bibliographic entry see Field 05C.
W72-09646

DETERMINATION OF THE TOXICITY OF CONTAMINATED FRESHWATER WITH RESPECT TO CERTAIN HYDROBIONTS (OPREDELENIYE TOKSICHNOSTI ZAGRYAZNENNYKH PRESNYKH VOD V OTNOSHENII NEKOTORYKH GIDROBIONTOV),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05C.
W72-09649

EFFECTS OF DDT AND HEXACHLOROCYCLOHEXANE ON AQUATIC ANIMALS (K VOPROSU O VLIYANII DDT I GEKSAKHLORANA NA VODNYYE ORGANIZMY),
Dnepropetrovskii Gosudarstvennyi Universitet (USSR). Institut Gidrobiologii.
For primary bibliographic entry see Field 05C.
W72-09652

ECOLOGY OF THE EPIPELIC ALGAL COMMUNITIES IN MARION LAKE, BRITISH COLUMBIA,
State Univ. Coll., Plattsburgh, N.Y.
For primary bibliographic entry see Field 05C.
W72-09681

MATHEMATICAL MODELS FOR THE PREDICTION OF THERMAL ENERGY CHANGES IN IMPOUNDMENTS.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 05B.
W72-09727

RESEARCH ON THE PHYSICAL ASPECTS OF THERMAL POLLUTION.
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
For primary bibliographic entry see Field 05B.
W72-09728

PLANT INDICATORS FOR PH AND WATER LEVEL IN PEATLANDS AT CANDLE LAKE, SASKATCHEWAN,
Great Lakes Forestry Research Center, Sault Sainte Marie (Ontario).
J. K. Jeglum.
Canadian Journal of Botany, Vol 49, No 9, p 1661-1676, 1971.
Identifiers: Canada, Candle Lake, Coefficient, *Indicators, Lakes, Peatlands, Plants, Saskatchewan, Techniques, *Water levels, *Hydrogen ion concentration, *Soil-water-plant relationships.

Quantitative data on vegetation, depth to water level, and pH of both moist peat and water form 113 stands of peatland near Candle Lake, Saskatchewan, are used to demonstrate relationships of peatland species to classes of pH and depth to water level, and to recognize plant indicators for the various classes. Weighted average and similarity coefficient techniques are used to estimate pH and depth to water level from total species lists and restricted lists of important species. Total species lists, combined with either weighted average or similarity coefficient techniques, yield indices with the highest correlations with the true values and the lowest standard errors of estimate. Depth to water level and pH are recognized as 2 important environmental correlates with floristic and vegetational variation in peatlands.--Copyright 1972, Biological Abstracts, Inc.
W72-09730

ELUTION OF MINERAL COMPONENTS OUT OF DEAD REED PHRAGMITES COMMUNIS TRIN,
Polish Academy of Sciences, Warsaw. Dept. of Applied Limnology.
M. Planter.
Pol Arch Hydrobiol. Vol 17, No 3, p 357-362. 1970. Illus.
Identifiers: *Elution, Lakes, *Minerals, Phragmites communis M, *Reed M.

The elution of mineral components out of ripe, dead reed into water in a lake was studied. The elution rates of Na, K, Ca, N-NH4 and PO4 were different.--Copyright 1972, Biological Abstracts, Inc.
W72-09778

URBAN PUBLIC POLICY AND POLITICAL INSTITUTIONS FOR WATER-QUALITY MANAGEMENT ON LAKE ERIE: YEAR ONE,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 05G.
W72-09787

2I. Water in Plants

VEGETATION STRIPES ON SHEET WASH SURFACES,
Hunting Technical Services Lts., Boreham Wood (England).
L. P. White.
Journal of Ecology, Vol 59, No 2. p 615-622. 1971. Illus.
Identifiers: Arid, Climate, Sheet flow, *Vegetation, *Vegetation effects, *Soil surfaces.

Striped vegetation patterns occur on sheet wash surfaces of the arid and sub-arid zones. These are smooth surfaces on which the slope is too slight for rill or gully erosion and run-off occurs as sheet flow. The maximum slope on which stripes have been described is 1 in 50; most are on slopes of 1 in 100 or less. Rainfall in these areas is markedly seasonal. The maximum for any occurrence of stripes is 750 mm per year and they occur in areas with 50 mm annual rainfall. The stripes are not due to gross soil differences, and differences in soils between the vegetation stripes and the intervening lanes are due entirely to the influence of the vegetation. Soils within stripes have thickened A horizons with improved permeability and surface moisture penetration. Some have surface accumulations of permeable wind-blown material that has been trapped by the vegetation. In some cases there is a marked leaching of soluble salts within the arcs and the impression of carbonate and silica hardpans has been described. Different factors have initiated the patterns in different areas. At the arid margin of the climatic zone in which the patterns occur, arcs probably originated by the extension of scattered individuals or colonies on land surfaces previously only sparsely vegetated. At the humid margin of the zone, patterns most probably developed by the coalescing of areas of bare ground formed by faunal activity. The patterns are apparently highly stable provided that environmental conditions remain unchanged. This does not necessarily preclude the migration of stripes within the patterns, or local re-orientation due to accident. In most cases the vegetation is probably a climatic climax or grazing sub-climax, and severe degradation is likely to take place if the arcs are destroyed. As the development of the arcs is conditional upon the interaction of critical climatic and geomorphic factors they are likely to have been in existence as long as the surfaces on which they occur have been subject to the appropriate climatic conditions.--Copyright 1972, Biological Abstracts, Inc.
W72-09307

PATTERN IN DESERT PERENNIALS,
Australian National Univ., Canberra. Research School of Biological Sciences.
D. J. Anderson.
Journal of Ecology. Vol. 59, No. 2, p 555-560. 1971.
Identifiers: *Desert, Larrea divaricata D, *Distribution patterns, *Perennials.

Evidence for regularity of distribution in 3 populations of desert shrubs is reviewed and evaluated. It is argued that the common interpretation of the mechanism underlying distributional regularity-competition between adjacent shrubs for a limited water supply-is not justified in the light of data available for pattern in Larrea divaricata populations in relation to mean annual rainfall. Some of the assumptions which underlie this usual interpretation are reviewed and discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-09333

PHYSICAL AND BIOTIC FACTORS AFFECTING EUXOA SPECIES ABUNDANCE IN WESTERN NORTH AMERICA: A REGRESSION ANALYSIS,
Department of Agriculture, Ottawa (Ontario). Entomology Research Inst.
D. F. Hardwick, and L. P. Lefkovitch.
Canadian Entomologist, Vol 103, No 9, p 1217-1235. 1971. Illus. Map.
Identifiers: Abundance, Biota, *Euxoa, North America, Rainfall, *Regression analysis, Temperature, *Distribution.

In an attempt to evaluate the importance of physical and biotic factors affecting the distribution of species of the cutworm genus Euxoa, a multivariate regression analysis, as based on a light-trapping survey in western North America, was conducted. The possible contributory factors have been grouped into 4 major categories relating to geography, habitat, period of flight, and sample size. Sample size is a composite value reflecting both suitability of habitat and suitability of weather conditions at the time the sample was taken. Geographic factors considered were latitude, altitude, and longitude; habitat factors were mean annual temperature, mean July temperature, mean Jan. temperature, mean annual rainfall and plant form; factors relating to period of flight were calendar date, mean temperature on date of sample, photoperiod, and the phenological date. Except for photoperiod, the variables listed were considered in a quadratic as well as a natural function in the regression analysis. With the number of species of Euxoa as the dependent variable and the factors listed above as the independent variables, a total reduction of 76.0% in the residual variance was obtained. When only 4 variables, sample size, mean annual temperature, mean annual rainfall, and phenological data were employed in a similar regression analysis, however, a reduction of 68.7% in the residual variance was obtained. On the basis of present evidence, it appears that temperature and rainfall are primary factors governing the abundance of species of Euxoa in a given habitat.--Copyright 1972, Biological Abstracts, Inc.
W72-09414

ADVANCING FRONTIERS OF PLANT SCIENCES, VOL. 27. A WHOLE-SYSTEM APPROACH TO WATER PHYSIOLOGY IN PLANTS,
J. J. Oertli.
Impex India: Delhi, India. 1971. 200 p. Illus.
Identifiers: Book, Elongation, Osmosis, *Plant physiology, Pressure, Root development, Salinity, Transpiration, Transport, Moisture stress.

This volume of the series provides a whole-system approach to water physiology in plants. The physiological significance of such properties as cellular water content, transpiration rate and water potential is analyzed. Cellular water conditions are described in terms of independent variables; the results are applied to a description of the: development of sub-optimal moisture conditions with matric and osmotic moisture stress; development of root pressure and related phenomena; active transport of water; and irreversible cell elongation. A brief account of the thermodynamic basis of water potentials is presented. The importance of osmotic effects under both saline and non-saline conditions is underlined by the fact that a large portion of this book is devoted to solute-water interactions. An extensive bibliography and author and subject indexes are included.--Copyright 1972, Biological Abstracts, Inc.
W72-09523

THE RESPONSES OF MOLINIA CAERULEA AND ERICA TETRALIX TO SOIL AERATION AND RELATED FACTORS. III. EFFECTS OF DIFFERENT GAS CONCENTRATIONS ON GROWTH IN SOLUTION CULTURE; AND GENERAL CONCLUSIONS,
University of the Panjab, Lahore (Pakistan). Dept. of Botany.
K. H. Sheikh.
Journal of Ecology. Vol 158, No. 1, p 141-154. 1970. Illus.
Identifiers: *Aeration, Calluna vulgaris D, Carbon, Competition, Culture, Erica tetralix D, *Gases, Hydrogen, Molinia caerulea M, Nutrients, Oxide, Oxygen, Soils, Sulfide, Saturated soils, *Plant growth.

In experiments, each lasting 15 days, M. caerulea and E. tetralix were grown separately in water cultures supplied with factorial combinations of 4 concentrations of O2 (0,2,4 and 8%) with 4 of either CO2 (2,4,8 and 16%) or H2S (0.06, 0.12, 0.24 and 0.48%). These concentrations covered the range found in the soil water samples obtained from the wet-heath sites studied. Methods for the control and maintenance of different mixtures of gases are described. The results are discussed in the light of previous information. The findings of other papers in the series are summarized. E. tetralix dominates a waterlogged site, such as the Valley-hog, because the species has a very low nutrient requirement and can, therefore, avoid competition from M. caerulea (and Calluna vulgaris) which has a high nutrient requirement. Although E. tetralix is sensitive to poor aeration, it to some extent evades this unfavorable aspect of the habitat because of its shallow root system. Molinia seems to be better adapted than Erica to grow with its roots in a poorly aerated medium if the medium also contains adequate nutrients. A badly waterlogged site, such as the Valley-hog, is a refuge for Erica rather than a site which provides optimum soil conditions for the growth of the species.--Copyright 1972, Biological Abstracts, Inc.

W72-09572

AN ANALYSIS OF FOUR TROPICAL RAIN FOREST SITES IN NEW GUINEA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
K. Paijmans.
Journal of Ecology. Vol. 58, No 1, p 77-101. 1970. Illus. Maps.
Identifiers: Araucaria hunsteinii G, Diversity, *Rain forests, Girth, Height, New Guinea, Sites, Stratification, Trees.

The plots, 2 ac (0.8 ha) each, ranged in altitude from 1975 to 3700 ft (600-1125 m). Plots 1 and 2 were in forest on moderately steep hill slopes, and Plots 3 and 4 on a gently sloping plateau surface. Plot 4 was on the break of slope towards a nearly level river terrace. Stratification of tree heights was studied by means of profile diagrams, height histograms, and graphs showing total crown width plotted against height class. With the exception of a dense layer of small trees between 15 and 25 ft (5-8 m) no clear evidence of layering was found. A comparison of profile diagrams with measurements made during and after felling indicated considerable errors in the initial diagrams. Various structural features, notably tree density, girth distribution and buttressing, are correlated with topography and showed a trend from Plots 1 and 2 to Plot 3 thence to Plot 4. Araucaria hunsteinii in Plot 2 seems an element additional to the mixed broad-leaved forest; it is responsible for the large number of trees in the highest height class, for the high average girth, and for a total basal area almost double that of broad-leaved forest alone. Excluding Araucaria from Plot 2 for the sake of comparison, Plot 4 had the highest average girth, and the lowest number trees, while basal areas did not differ greatly between plots. The relationship between tree girth at breast height and crown width proved to be practically linear for crown diameters between 25 and 45 ft (7.5-13.5 m), and within this range crown diameters are from 23-24 times as large as bole diameters. With increasing tree height the frequency of cylindrical and conical crowns decreases, and that of round and flat crowns increases. The percentage of cylindrical and conical crowns is positively correlated with tree density. The number of species per 2 ac sample plot is above average for tropical lowland rain forest. Additive species/area curves show little sign of flattening out, and no minimum area for adequate sampling could be established. None of the plots shows family or species dominance, species diversity between plots is high, and the flora seems to vary continuously. Most species tested for group forming were found to be more or less randomly distributed, but instances of pattern occur in each plot.--Copyright 1972, Biological Abstracts, Inc.
W72-09576

SEASONAL AND DIURNAL CHANGES IN MOISTURE CONTENTS AND WATER DEFICITS OF ENGELMANN SPRUCE NEEDLES,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
Botanical Gazette, Vol 132, No 4, p 327-332, 1971.

Descriptors: *Moisture content, *Moisture deficit, *Moisture stress, *Period of growth, Plant physiology, Translocation, Transpiration, Turgidity, Water balance, Water loss, New Mexico, Rocky Mountain Region, Pine trees.
Identifiers: *Engelmann spruce, *Spruce needles.

Changes in moisture contents, dry matter, water components, and water deficits of year-old needles from 20-year-old Engelmann spruce (Picea engelmanni Parry) were followed for 1 year in northern New Mexico. Moisture percentages reached a seasonal high in March and a low before budbreak in June. The decline was associated primarily with an increase in dry matter. Dry matter then declined while moisture percentage increased from June until early August. Subsequent fluctuations in dry matter and water components were minor. Water deficits were highest during the primary growing season June through October. (Forest Service)
W72-09606

VERTICAL PROFILES OF WINDSPEED IN A PINE STAND,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
J. D. Bergen.
Forest Science, Vol 17, No 3, p 314-321, 1971. 7 fig, 12 ref.

Descriptors: *Winds, *Meteorology, *Flow characteristics, Air circulation, Micrometeorology, Climatology, Fluid friction, Flow rates, Boundary layers, Lodgepole pine trees.

Simultaneous measurements of windspeed were made at six heights extending to the top of a lodgepole pine stand. These profiles were measured in simultaneous pairs, using movable masts at a number of points between trees. Associated windspeeds and air temperatures were measured at three levels above the canopy at a fixed location, together with above-canopy wind direction. The data indicate that, for a given wind direction and position in the stand, the windspeed profile expressed as a fraction of the friction velocity above the stand is invariant for a relatively wide range of windspeeds above the canopy. These scaled profiles are combined to form an average local maximum speed profile for the stand. Both point profiles and the combined profile show a minimum in the live crown and a subcanopy maximum. Average differences between simultaneous profiles were about 10 percent below the live canopy and 20 percent in the low-speed canopy region. (Forest Service)
W72-09609

PATTERNS OF USE OF A FLOOD PLAIN BY ZAMBIAN MAMMALS,
Akron Univ., Ohio. Dept. of Biology.
W. Osborne Sheppe.
Ecological Monographs, Vol 41, No 3, p 179-205, 1971, Illus.
Identifiers: Aardvark, Ants, Crocodile, Fish, *Flood plains, Frog, Hippopotamus, Kudu, Lechwe, *Mammals, Mastomys-Natalensis, Oryza-Barthii-M, Otter, Snakes, Squirrel, Vervet, Wildebeest, Zambia, Zebra.

Every year the Kafue River, a main tributary of the Zambezi River, Zambia, floods a broad level area, the Kafue Flats, to a depth of up to 5 m for several months. The flats are 235 km long and up to 40 km wide. The life of the flats is conditioned primarily by the alternating rainy and dry seasons and by the floods. About 80 cm of rain falls from Nov. to April. The Kafue rises slowly during the rains, is highest in May, and falls during the latter part of the dry season. Vegetation is composed primarily of grasses, especially Oryza barthii. Because of the abundant water the primary productivity of the flats is much greater than that of the surrounding woodlands. Secondary productivity also is high. Every year there is an alteration of aquatic and terrestrial faunas. During the floods fish move onto the flats from the Kafue, and most spawning takes place there. Terrestrial species are driven off, but as the floods recede they reoccupy the flood plain and use what is the best grazing in the region. Large mammals find shelter in tall stands of grass, small mammals in the thick mat of vegetation that covers much of the ground or in the deeply cracked soil. There is a gradient in use of the flood plain: some species (hippopotamus, otter) always stay near the river at low water, others (lechwe, zebra-wilde-beest) go for varying distances onto it, and more than half of the mammals (kudu, squirrel, vervet, aardvark) go onto it little, if at all. Failure to use the flood plain seems to be due to absence of suitable habitats or food. The most abundant large mammal on the flood plain is the lechwe, the only terrestrial ungulate that sometimes feeds in the floodwaters. Several shrews and mice, especially Mastomys natalensis, are common on the flood plain and breed there during the rains. During the floods they leave the flood plain or take refuge on natural levees along the Kafue. Large populations of water birds are common. Crocodile and monitor live near the water's edge and move in and out with the floods like the hippopotamus. Some snakes are common on the flats, but turtles and frogs are not. Although ants and termites are abundant in the surrounding region, they are largely excluded from the flats by the floods.--Copyright 1972, Biological Abstracts, Inc.
W72-09724

EFFECT OF OSMOTIC AND MATRIC POTENTIALS ON THE AVAILABILITY OF WATER FOR SEED GERMINATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. R. McWilliam, and P. J. Phillips.
Aust J Biol Sci. Vol 24, No 3, p 423-431. 1971. Illus.
Identifiers: Absorption, Drought, *Germination, Grass-M, *Matric potential, *Osmotic potential, Phalaris-M, Rye, Seed, Soils, Stress, Soil-water-plant relationships.

Under special conditions where soil-moisture diffusivity and seed-soil contact are nonlimiting, the osmotic and matric potentials of the substrate were found to be equivalent in their effect on the germination of seeds of ryegrass and dehulled phalaris over a range of water potentials from 0 to 15 bars. However, with intact phalaris seeds it appears that the seed coat constituents show a large resistance to the absorption of soil water, and under these conditions the equivalence between osmotic and matric potential no longer holds, and results of germination under osmotic stress must be used with caution in predicting the germination behavior of seeds in dry soil. Germination of both species declined with decreasing potentials, although ryegrass was more tolerant for stress, and there was significant % of germination of this species at potentials about 6 bars below that which prevented germination of phalaris. While the tolerance of moisture stress germination may be 1 of the factors contributing to the relative ease of establishment of this species under field conditions, it did not provide a reliable index of drought tolerance in mature plants.--Copyright 1972, Biological Abstracts, Inc.
W72-09773

MODEL OF PLANT PRODUCTIVITY AT LIMITED WATER SUPPLY CONSIDERING ADAPTATION,
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
H. Moldau.
Photosynthetica. Vol 5, No 1, p 16-21. 1971. Illus.
Identifiers: Adaptation, Competition, *Model studies, Photosynthesis, *Plant productivity, Respiration, Stomata.

Proceeding from the principle of maximum productivity and from the equation of water balance of a plant, a rule for stomatal opening is derived. Combining this rule with the light curve of photosynthesis and assuming coupling between photosynthesis and respiration, a formula for net photosynthesis at limited water supply is proposed. The optimal value of root-to-leaf area ratio depending on moisture and radiation regime is given. According to the model, the highest root-to-leaf area ratios must be adjusted in the regions of high irradiance and dry climate. Species which have higher respiration efficiency are more favored in the interspecific competition at given conditions of water deficit.--Copyright 1972, Biological Abstracts, Inc.
W72-09782

RESPONSES OF STOMATA TO CHANGES IN HUMIDITY,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
For primary bibliographic entry see Field 02D.
W72-09783

WATER MOVEMENT IN A PLANT CELL ON APPLICATION OF HYDROSTATIC PRESSURE,
Osaka Univ. (Japan). Faculty of Sciences.
M. Tazawa, and K. Kiyosawa.
Annu Rep Biol Works Fac Sci Osaka Univ. Vol 18, p 57-69. 1970. Illus.
Identifiers: *Plant cells, *Hydrostatic pressure, Membranes, Method, *Water movement, *Nitella flexilis, Osmosis, Permeability, Plants, Pressure, Squid, Thermodynamics.

A new method was introduced to determine water permeability by applying hydrostatic pressure using internodal cells of Nitella flexilis, the same material in which osmotic water permeability was measured by the method of transcellular osmosis. Water permeability measured by the use of a mechanical method was identical with permeability measured by the osmotic method. Thus, in the cell of Nitella the osmotic pressure exerted the same effects on water flow as hydrostatic pressure. This was in agreement with irreversible thermodynamics which claims the equivalency of osmotic pressure and hydrostatic pressure in semipermeable membranes. Kinetic analysis based on the assumption that the effects of hydrostatic pressure and osmotic pressure on water flow were additive could satisfactorily explain the time course of the flow due to hydrostatic pressure. In respect to water permeability across the cell membrane, the Nitella cell made a striking contrast to the giant axon of the squid where permeability to water is much higher when measured mechanically than when measured osmotically. On the basis of the present results and those from other living and non-living membranes, discussions were made on the nature of the osmotic flow in Nitella where non-diffusional flow is probably dominant.--Copyright 1972, Biological Abstracts, Inc.
W72-09786

2J. Erosion and Sedimentation

AGE OF THE LAST GLACIAL MAXIMUM IN THE WESTERN DVINA-DNIEPER INTERFLUVE (VOZRAST MAKSIMAL'NOY STADII POSLEDNEGO OLEDENENIYA NA MEZHDURECH'YE ZAPADNOY DVINY I DNEPRA),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 02C.
W72-09255

DISTRIBUTION AND COMPOSITION OF CARBONATES IN THE UPPER LAYER OF BOTTOM SEDIMENTS OF THE ATLANTIC OCEAN (RASPREDELENIVE I SOSTAV KARBONATOV V VERKHNEM SLOYE DONNYKH OSADKOV ATLANTICHESKOGO OKEANA),
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
Ye. M. Yemel'yanov, A. P. Lisitsyn, and B. A. Koshelev.
Akademiya Nauk SSSR Doklady, Vol 196, No 1, p 207-209, 1971. 1 fig, 7 ref.

Descriptors: *Oceanography, *Atlantic Ocean, *Bottom sediments, *Carbonates, *Calcium carbonate, Calcite, Coral, Invertebrates, Depth, Shallow water, Climatic zones, Maps, Sampling.
Identifiers: *USSR, Fossils, Bryozoans, Foraminifera, Aragonite.

Bottom sediment samples from the Atlantic Ocean were examined to prepare a map of CaCO3 distribution. The map, drawn to a scale of 1:10 million on a Mercator projection, was used to calculate areas of bottom sediments with different CaCO3 concentrations, expressed as a percentage of the total area of the ocean floor. Sediments containing more than 30% CaCO3 cover more than half the ocean floor (53.2%) and extend from latitudes 73.5 deg N to 56 deg S. Sediments containing more than 50% CaCO3 cover 33.8% of the ocean floor and extend from latitudes 70.2 deg N to 55 deg S. The CaCO3 concentrations are highest (90%-95%) between latitudes 38.5 deg N and 28.5 deg S (the tropical and equatorial zones). The distribution of CaCO3 in the Atlantic is asymmetric to the equator: in the northern hemisphere the boundaries of the different zones of carbonate sediments are 10 deg to 23 deg of latitude closer to the pole than in the southern hemisphere. This is due to the hydrodynamics of the ocean and to the presence in the northern hemisphere of the Gulf Stream and North Atlantic current. (Josefson-USGS)
W72-09256

INITIATION OF RIPPLES BY ARTIFICIAL DISTURBANCES,
Bechtel Corp., San Francisco, Calif. Slurry Pipeline Development.
P. B. Williams, and P. H. Kemp.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY6, Paper 8952, p 1057-1070, June 1972. 8 fig, 1 tab, 4 ref, append.

Descriptors: *Ripple marks, *Sediment transport, *Bed load, *Flow around objects, *Sand waves, Sands, Hydraulic models, Sedimentation, Scour, Shear stress, Particle size, Alluvial channels.

Sediment ripples were experimentally produced on flat channel beds by artificial disturbances, at lower flows than those at which ripples form naturally. The artificial disturbances, consisted of vertical thin plates set normal to the flow. These plates produced separation eddies. The development of a ripple train downstream of the disturbance is related to the bed shear stress measured upstream of the disturbance. The initiation of ripples in these circumstances is also related to the height of the disturbance, the water depth, and grain diameter, in addition to the normal parameters of Reynolds Number and Shields Mobility Number. Quartz grains of 0.137 mm and 0.495 mm and 2.0 mm median diameter were used. (Knapp-USGS)
W72-09260

WATER EROSION OF SOILS IN THE OB' RIVER REGION NEAR NOVOSIBIRSK (VODNAYA EROZIYA POCHV NOVOSIBIRSKOGO PRIOB'YA),
Novosibirsk Inst. of Agrochemistry and Soil Science (USSR).
A. D. Orlov.
Izdatel'stvo 'Nauka' Sibirskoye Otdeleniye, Novosibirsk, 1971. 176 p.

Descriptors: *Soils, *Soil erosion, *Erosion rates, *Erosion control, Geomorphology, Topography, Meteorology, Snow cover, Surface runoff, Soil water, Soil classification, Soil groups, Soil profiles, Soil physical properties, Particle size, Sediments, Slopes, Gullies, Crop production, Investigations.
Identifiers: *USSR, *Ob' River, *Novosibirsk Oblast, *Water erosion, Regionalization.

Investigations were conducted in 1961-66 in upper basin reaches of the Ob' River near Novosibirsk. The region examined covers an area of more than 5 million ha and includes the Bolotnoye, Iskitim, Kolyvan', Kochenevo, Maslyanino, Novosibirsk, Ordynskoye, Suzun, Toguchin, and Cherepanovo Rayons of the Novosibirsk Oblast. The purpose of the investigations was (1) to determine the areal distribution of water erosion; (2) to ascertain the causes of erosion processes; (3) to study the patterns of development of surface runoff and soil erosion; (4) to determine the degree of soil susceptibility to erosion and the effect of erosion on soil fertility and crop production; (5) to divide the region into soil-erosion zones on the basis of erosion rates and intensity; and (6) to develop measures to control soil water erosion. (Josefson-USGS)
W72-09281

HISTORY OF THE WORLD'S OCEANS (ISTORIYA MIROVOGO OKEANA).
For primary bibliographic entry see Field 02L.
W72-09282

NEW GENETIC TYPE OF TIN PLACERS IN THE NORTHEASTERN YAKUTSK ASSR (NOVYY GENETICHESKIY TIP OLOVONOSNYKH ROSSYPEY V SEVERO--VOSTOCHNOY YAKUTII),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Mineralnogo Syrya, Moscow (USSR).
L. Z. Bykhovskiy, S. I. Gurvich, and N. G. Patyk-Kara.
Akademiya Nauk SSSR Doklady, Vol 196, No 6, p 1407-1409, 1971. 1 fig, 1 ref.

Descriptors: *Sedimentation, *Lake sediments, *Lake basins, *Placer mining, *Mineralogy, Topography, Rocks, Unconsolidated sediments, Solifluction, Age.
Identifiers: *USSR, *Yakutsk ASSR, *Placer deposits, *Tin, Cassiterite, Wolframite, Thermokarst, Plutons, Tectonics.

The northeastern part of the Yakutsk ASSR is one of the largest tin-bearing areas of the Soviet Union. Tin placers in sediments have widely differing ages, and locations range from eluvial hillside placers to coastal marine placers. Old, buried placers, genetically unrelated to the present drainage system and shoreline, have recently been discovered on the Polousnyy ridge and adjacent marine plain. Lake basins formed by thermokarst processes are typical of the Holocene and Upper Quaternary topography of depressions of the area. Hydrodynamic conditions are conducive to the formation of placers in the Baky Lake basin, formed by a combination of damming and thermokarst processes and covering an area of about 20 sq km. The age of the basin suggests that it may contain placers more complex than the present lacustrine type. Productive potential of the sediments is confirmed by the discovery of relatively high cassiterite and wolframite concentrations in ancient lake sediments along lower reaches of the Omchikandya River. A high cassiterite concentration in bottom and shore sediments of lakes in regions with weak tin mineralization calls for more detailed investigation of lake sediments of different ages in the Mesozoic tin province of the northeast USSR. (Josefson-USGS)
W72-09283

GEOLOGIC AGE OF ANCIENT LAKE SEDIMENTS OF THE MOLOGO-SHEKSNA DEPRESSION (O GEOLOGICHESKOM VOZRASTE DREVNEOZERNYKH OTLOZHENIY MOLOGO-SHEKSNINSKOY NIZINY),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
R. Ye. Giterman, and A. I. Moskvitin.
Akademiya Nauk SSSR Doklady, Vol 196, No 4, p 909-912, 1971. 1 fig, 5 ref.

Descriptors: *Lake sediments, *Glacial sediments, *Glaciation, *Age, *Dating, Time, Climatic data, Palynology, Pollen, Spores, Dendrochronology, Trees, Forests, Glacial drift, Mud, Silts, Clays, Varves, Cores.
Identifiers: *USSR, *Yaroslavl' Oblast, *Glacial lakes, *Interglacial, Gyttja, Lamination.

Core samples were collected in 1068 to study the age of ancient lake sediments in the Mologo-Sheksna Depression near the village of Gorelovo in the Breytovo Rayon of the Yaroslavl' Oblast. A complete sequence of early lake sediments was established, beginning with the underlying laminated glacial lacustrine clay. Judging by the geologic cross section and preliminary results of spore-pollen analyses, the early lake sediments date from the last Mologo-Sheksna Interglacial, which is 25 to 42 thousand years old. Lacustrine mud or gyttja of the Mikulino Interglacial near the

town of Rybinsk indicates the possible presence of sediments of earlier interglacials, especially near the southern edge of the depression. The possibility of older lake sediments in the area must be considered in any future investigation. (Josefson-USGS)
W72-09284

RADIOCARBON DATING OF TERRACES OF THE UPPER OB' REGION (ALTAY PIEDMONT PLAIN) (RADIOUGLERODNYYE DATIROVKI TERRAS VERKHNEGO PRIOB'YA (PREDALTAYSKAYA RAVNINA)),
Akademiya Nauk SSSR, Novosibirsk. Institut Geologii i Geofiziki.
L. V. Firsov, V. A. Panychev, and L. A. Orlova.
Akademiya Nauk SSSR Doklady, Vol 196, No 1, p 180-182, 1971. 1 tab, 2 ref.

Descriptors: *Terraces (Geologic), *Sediments, *Radioactive dating, Age, Glaciation, Erosion, Deposition (Sediments), Flood plains, Trees, Peat, Sampling, Dendrochronology.
Identifiers: *USSR, *Altay Territory, *Ob' River, *Radiocarbon dating, *Radioactive age determination, Geochronology, Interglacial.

Age determination of terraces on the Altay Piedmont Plain of the Upper Ob' was based on 22 radiocarbon dates for wood and plant remains and for peat in the Novosibirsk-Kamen'-Biysk region. Terraces with sediments representing two cycles of erosion and deposition are widespread in the area. Terraces of equal or nearly equal height differ in age, which increases with their distance from the river valley. (Josefson-USGS)
W72-09285

DDT RESIDUES IN SALINAS RIVER SEDIMENTS,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 05B.
W72-09313

SEDIMENTARY STRUCTURES FORMED BY FLASH FLOODS IN SOUTHERN ISRAEL,
Geological Survey of Israel, Jerusalem.
I. Karcz.
Sedimentary Geology, Vol 7, No 3, p 161-182, April 1972. 7 fig, 5 plate, 33 ref.

Descriptors: *Bed load, *Sedimentary structures, *Flash floods, Sand waves, Ripple marks, Dunes, Scour, Sand bars, Gullies, Channel morphology, Arid lands, Meanders.
Identifiers: *Israel, Negev.

During the rainy season the ephemeral streamcourses of southern Israel are swept by flash floods of low volume and short duration, which produce meander bars, megaripples and ripples, harrow marks, current lineations, obstacle marks, washouts and remnant bars, rhomboid marks, rill marks, rare convolute lamination, imbrication, mud pebbles and polygonal desiccation patterns. The rapid abatement of floods results in a variety of coexisting, interfering and superimposed associations of bed forms, which shed light on some aspects of provenance and origin of alluvial bed forms. (Knapp-USGS)
W72-09540

AN INVENTORY OF PUBLISHED AND UNPUBLISHED FLUVIAL-SEDIMENT DATA FOR CALIFORNIA, 1956-70,
Geological Survey, Menlo Park, Calif.
G. Porterfield.
Geological Survey Open-file Report, January 18, 1972. 26 p, 2 fig, 6 ref.

Descriptors: *Basic data collections, *Sediment yield, *Sediment transport, *California, Sediment discharge, Suspended load, Turbidity, Erosion, Information retrieval, Gaging stations, Rivers.
Identifiers: Sediment-data inventory (Calif).

This inventory provides a convenient reference to published and unpublished fluvial-sediment data collected in California during 1955-70. It substantially updates previous inventories. Sediment stations are listed in downstream order, and data tabulation includes the station number and name, latitude and longitude, drainage area (sq mi), sampling frequency, and the period of record. An alphabetical list of the stations is given with station numbers. Cooperating Federal, State and local agencies involved in the data gathering programs are listed and a history is given of sediment work in California, beginning in 1876. (Land-USGS)
W72-09542

PERMAFROST EROSION ALONG THE BEAUFORT SEA COAST,
Denver Univ., Colorado. Dept. of Geography and Geology.
R. I. Lewellen.
March 1970. 25 p, 34 fig, 11 ref.

Descriptors: *Erosion, *Permafrost, *Alaska, *Melting, Surf, Arctic, Frost, Soil mechanics, Tundra.
Identifiers: Beaufort Sea (Alaska), Point Barrow (Alaska).

Erosion of permafrost along the Beaufort Sea coast of Northern Alaska is a severe problem. The thermal erosion of permafrost along the coast results in shoreline recessions as great as ten meters per year. The recession is caused by wave action and air temperatures thawing the frozen sediments. The two areas which are discussed in detail are Elson Lagoon and Flaxman Island. Elson Lagoon is located south of Point Barrow, Alaska. Flaxman Island is adjacent to the Prudhoe Bay oil development activity. (Knapp-USGS)
W72-09546

STUDIES OF SEDIMENT TRANSPORT IN THE COLUMBIA RIVER ESTUARY,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 05B.
W72-09551

A GUIDE TO THE GEOLOGY OF DELAWARE'S COASTAL ENVIRONMENTS,
Delaware Univ., Newark. Dept. of Geology.
J. C. Kraft.
Available from the National Technical Information Service as AD-736 036, $3.00 in paper copy, $0.95 in microfiche. College of Marine Studies Publication 2GL039, Delaware University, 1971. 220 p, 114 fig, 19 ref. (Prepared for Geological Society of America Annual Meeting and Field Trip October 30-November 3, 1971.) Contract ONR N00014-69-A-0407.

Descriptors: *Coasts, *Beach erosion, *Sediment distribution, *Shore protection, *Delaware, Hydrogeology, Atlantic Ocean, Sea level, Bays, Estuaries, Lagoons, Dunes, Marine geology, Berms, Marshes, Geomorphology, Reviews, Evaluation, Littoral drift, Salinity, Water levels, Tidal effects.
Identifiers: *Coastal geomorphology (Del).

The low-lying Delaware coast includes the highly varied geomorphic elements of a major estuary; highlands undergoing erosion; spits; dunes; marshes; and a lagoon-barrier shoreline. Vertical sediment sequences and geomorphic patterns as interpreted in this study should form useful models in deciphering paleogeography and sedimentary processes of coastal change. A fuller understanding of these factors is useful in the solution of coastal erosion problems; in the projection of potential coastal change; in the formation of geological models of coastal change; and in operations affected by the physical condition of the sedimentary environment surfaces in lagoon-marsh-barrier coasts. The three major elements of coastal change identified include: (1) the relative rise in sea level (now proceeding at a rate of approximately 1/2 foot per century), (2) coastal erosion and deposition processes, and (3) the resultant sequences of sedimentary lithosomes which reveal the past history of coastal change. The physical elements of the coastal geology are illustrated with photographs comparing details on the surface and from the air. Many diagrams and cross sections interpret and project the structural information obtained in field surveys. (Woodard-USGS)
W72-09614

PROCEEDINGS - WORKSHOP ON SEDIMENT CONTROL.
For primary bibliographic entry see Field 04D.
W72-09656

CHANGE IN PROPERTIES OF CHERNOZEMS OF THE DNEPROPETROVSK OBLAST AS A RESULT OF EROSION (IZMENENIYE SVOYSTV CHERNOZEMOV DNEPROPETROVSKOY OBLASTI V REZUL'TATE EROZII),
For primary bibliographic entry see Field 02G.
W72-09744

RECONNAISSANCE STUDY OF SEDIMENT TRANSPORTED BY STREAMS, ISLAND OF OAHU,
Geological Survey, Honolulu, Hawaii.
B. L. Jones, R. H. Nakahara, and S. S. W. Chinn.
Hawaii Division of Water and Land Development Circular C33, November 1971. 45 p, 14 fig, 6 tab, 22 ref.

Descriptors: *Sediment yield, *Erosion, *Sedimentation, *Urban hydrology, *Hawaii, Urbanization, Storm runoff, Data collections, Land use, Sediment transport, Suspended load, Bed load, Sediment discharge.
Identifiers: *Oahu (Hawaii).

Data collected during the first 3 years of a sediment-measuring program were used to compute sediment yields for seven basins draining the Koolau Range and central part of the island of Oahu, Hawaii. Sediment yields range from 785 to 2,200 tons per square mile annually, suspended-sediment yields range from 630 to 1,400 tons per square mile, and bedload from 75 to 900 tons per square mile. Estimated mean annual discharge of sediment to Kaneohe Bay is about 37,000 tons, consisting of 19,000 tons of clay, 15,000 tons of silt, and 3,000 tons of sand, representing a deposited volume of 31 to 52 acre-feet annually. Although the investigation was island-wide, most of the data collected were from streams draining the central and southern Koolau Range--the part of the island undergoing the most intensive urban development. During urbanization, erosion and sediment-transport rates are altered greatly. Construction exposes large areas of soil. Compaction of soil by heavy equipment reduces infiltration, increasing surface runoff and erosion, and the landscaping process may change slope and stream-channel dimensions. Similar effects result from other urbanizing processes, such as road building, drainage alterations, and paving of parking areas. (Knapp-USGS)
W72-09759

DISTRIBUTIONAL TRENDS IN THE RECENT MARINE SEDIMENTS OF NORTHERN BAFFIN BAY,
Bedford Inst., Dartmouth (Nova Scotia). Marine Geology.
For primary bibliographic entry see Field 02L.
W72-09763

2K. Chemical Processes

PERFORMANCE AND APPLICATION OF A NEW REFERENCE ELECTRODE FOR

PROCESS POTENTIOMETRIC MEASUREMENTS,
Beckman Instruments, Inc., Fullerton, Calif.
For primary bibliographic entry see Field 05A.
W72-09242

DETERMINATION OF COPPER, IRON, AND ZINC FROM A SINGLE SMALL SAMPLE,
Wayne State Univ., Detroit, Mich. Dept. of Biochemistry; and Wayne State Univ., Detroit, Mich. Dept. of Pathology; and Wayne State Univ., Detroit, Mich. Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W72-09243

ELECTRO-OXIDATION OF IODINE ON SMOOTH PLATINUM IN AQUEOUS MEDIA,
Pisa Univ. (Italy). Istituto di Chimica Analitica ed Elettrochimica.
For primary bibliographic entry see Field 05A.
W72-09245

BURNER MEMORY FOLLOWING ATOMIC ABSORPTION SPECTROPHOTOMETRIC ANALYSIS OF MODERATELY VOLATILE ORGANOMETALLIC COMPLEXES,
Union Carbide Corp., South Charleston, W. Va. Chemicals and Plastics.
For primary bibliographic entry see Field 05A.
W72-09247

THE SPECTROFLUORIMETRIC DETERMINATION OF SULPHIDE,
Sheffield Polytechnic (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-09253

RAPID PHOTOCHEMICAL DETERMINATION OF URANIUM (VI) AT TRACE LEVELS,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Central Research Dept.
For primary bibliographic entry see Field 05A.
W72-09254

GEOLOGY AND GROUND-WATER RESOURCES OF NORTHWESTERN NORTH CAROLINA,
North Carolina State Dept. of Water and Air Resources, Raleigh. Div. of Ground Water.
For primary bibliographic entry see Field 04B.
W72-09264

INVESTIGATION AND MEASUREMENT OF RADIUM IN RAMSAR MINERAL WATER,
Tehran Univ. (Iran). Dept. of Environmental Health.
For primary bibliographic entry see Field 05B.
W72-09266

GEOCHEMICAL STUDY OF THE GROUND WATER OF THE 'SABLES INFERIEURS' CONFINED AQUIFER, OF THE AQUITAINE BASIN (ETUDE GEOCHIMIQUE DE LA NAPPE DES 'SABLES INFERIEURS' DU BASSIN D'AQUITAINE),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
For primary bibliographic entry see Field 02F.
W72-09269

NATURAL ISOTOPES IN THE GROUNDWATER OF THE TULUM VALLEY, SAN JUAN, ARGENTINA,
Groningen Rijksuniversiteit (Netherlands). Physics Lab.
For primary bibliographic entry see Field 02F.
W72-09276

SOIL NITROGEN CYCLE--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02G.
W72-09299

SIMPLE DEVICE FOR INTRODUCTION OF MASS CALIBRANT INTO A GAS CHROMATOGRAPH-MASS SPECTROMETER SYSTEM,
Sun Oil Co., Marcus Hook, Pa.
D. M. Schoengold, and W. H. Stewart.

Descriptors: *Gas chromatography, *Mass spectrometry, *Calibrations, Analytical techniques, Spectrometers, Valves, Instrumentation, Laboratory equipment.
Identifiers: Nupro valve, Metering valves.

A technique is described for introducing a mass calibrant into a gas chromatograph-mass spectrometer system via the gas chromatograph. The calibration compound facilitates determination of the m/e values of peaks from the mass spectrometer. A Perkin-Elmer 500 gas chromatograph has been previously modified to allow the flow of helium to the separator to be regulated independently of flow through the column. In the further modification described, a Nupro Cross Pattern Very Fine metering valve was installed in the makeup line after the makeup flow control valve. About 25 inches of 1/16-in o.d.-0.010-in. i.d. stainless steel tubing was then attached to the variable orifice port of the Nupro valve. The other end was attached to a reducing union and hence to a panel of the gas chromatograph. The calibrant is injected into this coiled tubing and introduced into the mass spectrometer by opening the Nupro valve, with helium flowing through the makeup line, until calibrant peaks are observed. The technique is used primarily for samples introduced with the insertion probe, but it can also be used when the gas chromatograph is used as the sample introduction system. (Mortland-Battelle)
W72-09323

COATED WIRE ION SELECTIVE ELECTRODES,
Arizona Univ., Tucson. Dept. of Chemistry.
H. James, G. Carmack, and H. Freiser.
Analytical Chemistry, Vol. 44, No. 4, p 856-857, April 1972. 2 tab, 3 ref.

Descriptors: *Analytical techniques, *Ions, *Electrodes, Membrane processes, Ion exchange, Ammonium compounds, Salts, Ammonium salts, Sodium compounds, Chlorides, Bromides, Iodides, Sulfates, Nitrates, Anions, Anion adsorption.
Identifiers: *Ion selective electrodes, *Liquid membrane electrodes, *Ammonium ions, Chemical interference, *Aliquat 336S, Sodium salts, Perchlorate, Thiocyanate, Oxalate, Acetate, Benzoate, Salicylate, Phenylalanine, Leucine, Coated wire electrodes.

Coated wire or liquid membrane electrodes were examined for various systems based on the anion association complexes of a large quarternary ammonium ion, Aliquat 336S. The electrodes were first tested in pure solutions of the appropriate salts. Equilibrium potentials were achieved within a few seconds and were reproducible to plus or minus 0.5 mV or better. The potential response was linear with the logarithm of anion activity from 0.01 to at least 10 to the minus 2.6 power M although the useful concentration range was usually 0.1-0.0001 M. Interferences by other anions were determined by adding a sufficient amount of the interfering anion to a 0.001 or 0.004 M standard test solution to give a potential difference of from 10 to 100 mV from the pure test solution. The interferences, expressed as selectivity coefficients, of several anions are given for both the coated wire electrodes and the liquid-membrane electrodes and the coated wire electrodes give greater selectivity. This work demonstrated the general validity of the design and construction of so-called 'liquid membrane' ion-selective electrodes without an internal reference solution. Further refinement in fabrication should permit the development of electrodes sufficiently small to be used in intracellular measurements. The functioning of these electrodes requires that either the polymer-metal interface maintain a constant potential difference, or that this potential difference respond in a definite and reproducible manner to that of the test solution-polymer interface. (Mortland-Battelle)
W72-09324

ROLE OF SOLVENT EXTRACTION PARAMETERS IN LIQUID MEMBRANE ION SELECTIVE ELECTRODES,
Arizona Univ., Tucson. Dept. of Chemistry.
H. J. James, G. P. Carmack, and H. Freiser.
Analytical Chemistry, Vol. 44, No. 4, p 853-855, April 1972. 5 tab, 11 ref.

Descriptors: *Electrodes, *Analytical techniques, Membrane processes, Solvent extractions, Cation exchange, *Ions, Ion exchange, Amino acids, Radioisotopes, Radiochemical analysis, Salts, Iodine radioisotopes.
Identifiers: *Ion selective electrodes, *Liquid membrane electrodes, *Iodine 131, Radioisotope counting, Scintillation detector, Decanol, Chemical interference, Formate, Acetate, Propionate, Crotonate, Caproate, n-Octanoate, n-Decanoate, Benzoate, Salicylate, p-Toluenesulfonate, Glycine, Serine, Alanine, Valine, Methionine, Lysine, Leucine, Phenylalanine, Tryptophan.

A quantitative study of the extraction equilibria of a representative series of ion pair complexes was made to examine the postulated relationship of electrode selectivity to ion pair extractability. Determination of the participating equilibria of an ion pair complex extraction system containing an easily measured ion such as I-131 is relatively simple. Equal volumes of a 0.00330 M tetra-n-hexylammonium iodide solution in an organic solvent and an aqueous phase containing sufficient I-131 to give good counting statistics were shaken together for 30 minutes. The phases were separated and each phase pipetted into separate counting tubes. Radioisotope counting was done using a Nuclear-Chicago Model 186 scaler in conjunction with a Nuclear-Chicago Model DS-55 well-type scintillation detector. One major point of interest was to test the hypothesis that liquid-membrane, ion-selective electrodes function in a manner predictable from solvent extraction principles. This was done by comparing the competitive extraction constants of interfering anions with the corresponding selectivity constant. The results demonstrated the importance of considering extraction parameters in dealing with the electrode response characteristics. (Mortland-Battelle)
W72-09325

MASS SPECTROMETRIC ISOTOPE RATIO MEASUREMENTS AND PEAK AREA INTEGRATION USING THE PEAK-SWITCHING FEATURE OF THE AEI MS-902,
North Carolina Univ., Chapel Hill. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-09326

GC/MS/COMPUTERS,
Waterloo Univ. (Ontario). Dept. of Chemistry.
F. W. Karasek.
Analytical Chemistry, Vol. 44, No. 4, p 32-42, April 1972. 7 fig, 4 tab, 21 ref.

Descriptors: *Gas chromatography, *Digital computers, *Mass spectrometry, *Data processing, Ultraviolet radiation, Infrared radiation, Ionization, Chemical reactions, Organic compounds, Automation, Date storage and retrieval, Computer programs, Nuclear magentic resonance.

Identifiers: Plasma chromatography, Infrared spectroscopy, Ultraviolet spectrophotometry, Chemical ionization mass spectroscopy.

The combination of gas chromatography (gc) mass spectroscopy (ms) and a digital computer provides an unusual and powerful analytical tool. The capabilities of such a system and the techniques and instrumentation are discussed. The interfacing of a gas chromatograph to a mass spectrometer is now a widespread practice, and the principles of the technique are discussed in detail. Such a system generates a tremendous amount of data, most of which cannot be acquired manually. This situation can be remedied by computerizing the system. Computer hardware economically tailored to gc/ms applications is now available. The types of units available, their costs, and capabilities are reviewed and the types of data printouts provided are discussed. It is suggested that efforts now need to be expended toward reducing the cost and complexity of the systems and increasing their reliability. Additional effort is also required toward compilation of readily accessible reference spectra and development of schemes for automated structural retrieval from fragmentation patterns. (Mortland-Battelle)
W72-09327

DETERMINATION OF ANTIMONY IN GEOLOGICAL MATERIALS BY ATOMIC ABSORPTION SPECTROMETRY,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Geologicke Laboratorium.
For primary bibliographic entry see Field 05A.
W72-09328

THE DETERMINATION OF CALCIUM IN THE 0.1 TO 10 NG REGION BY ATOMIC ABSORPTION SPECTROSCOPY WITH THE HEATED GRAPHITE ATOMIZER,
Aarhus Univ., (Denmark). Inst. of Physiology.
For primary bibliographic entry see Field 05A.
W72-09329

DETERMINATION OF ALUMINUM IN WATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W72-09330

THE DETERMINATION OF LEAD AND CADMIUM IN SOILS AND LEAVES BY ATOMIC ABSORPTION SPECTROSCOPY,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 05A.
W72-09331

THE ROLE OF THE DIFFUSE LAYER IN WATER-IN-OIL MICROEMULSIONS,
University of Southern California, Los Angeles. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-09335

SIMPLE DEVICE FOR TRANSFERRING AND ELUTING THIN-LAYER CHROMATOGRAPHIC FRACTIONS,
Wisconsin Univ., Madison. McArdle Memorial Lab.
O. Sudilovsky, and P. H. Hinderaker.
Analytical Biochemistry, Vol 45, No 2, p 525-529, February 1972. 1 fig, 1 tab, 19 ref.

Descriptors: *Chromatography, Separation techniques, Instrumentation.
Identifiers: *Thin layer chromatography, Recovery, *Elution, Scraping, Vacuum aspiration, Adensosine monophosphate.

An elution technique for thin-layer chromatography is described which utilizes a device that combines scraping and vacuum aspiration principles. This technique allows for a fast, quantitative recovery of large thin-layer chromatographic fractions with practically no contamination from sample to sample. The device consists of a suction-scraper unit and an eluting unit. The former includes a glass tube, a stainless steel holder, and an ordinary razor blade, cut to size. The eluting unit contains a fritted glass filter. The suction-scraper unit is applied to a thin-layer plate after localization of the fractions for extraction. A lateral outlet on the eluting unit is connected to a vacuum pump and the absorbent coat is sucked off as it is scraped loose. The sample is stopped by the fritted glass disc in the elution unit. The same suction-scraper unit is used throughout the procedure with eluting units and collecting tubes replaced for each fraction. This apparatus allows rapid removal of areas up to 1.5 x 3.0 cm in less than 30 sec. and can be adapted to small areas by reducing the width of the suction-scraper. Contamination is shown to be less than 0.1 percent. (Mortland-Battelle)
W72-09342

A COMPARISON OF SOME READY-FOR-USE THIN LAYERS FOR THE SEPARATION OF HEAVY METALS WITH BUTANOL-3 N HCL,
Consiglio Nazionale delle Ricerche, Rome (Italy). Laboratorio di Cromatografia.
For primary bibliographic entry see Field 05A.
W72-09353

THE DETERMINATION OF TRACES OF NICKEL BY GAS-LIQUID CHROMATOGRAPHY,
Birmingham Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-09369

MORE ACCURATE GAS-CHROMATOGRAPHIC ANALYSIS USING FLAME-IONIZATION DETECTOR,
Monsanto Co., Texas City, Tex.
For primary bibliographic entry see Field 05A.
W72-09373

PRELIMINARY HYDROBIOLOGICAL RESEARCH OF SOME SOUTHEAST ASIAN INLAND WATERS, (IN JAPANESE),
Osaka Kyoiku Univ. (Japan). Biology Lab.
T. Mizuno, and S. Mori.
Mem Osaka Kyoiku Univ Nat Sci Appl Sci. 18: p 119-165. 1969. Illus. English summary.
Identifiers: Asia, Fish, *Hydrobiology, *Inland waterways, Management, Phytoplankton, Zooplankton.

Preliminary data include physiocochemical analysis of water samples, zooplankton, phytoplankton and fish species. Qualitative and quantitative comparisons are made on data obtained from the tropical Asian countries studied and programs are planned for the management and increased productivity of these inland waters.--Copyright 1972, Biological Abstracts, Inc.
W72-09394

NUCLEAR MAGNETIC RESONANCE STUDY OF INTERACTION BETWEEN ANIONIC AND NONIONIC SURFACTANTS IN THEIR MIXED MICELLES,
Kao Soap Co., Wakayama (Japan). Industrial Research Lab.
For primary bibliographic entry see Field 05A.
W72-09410

SELECTIVITY OF CYCLIC POLYETHER TYPE LIQUID MEMBRANE ELECTRODES,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-09415

HADAMARD-TRANSFORM SPECTROMETRY: A NEW ANALYTICAL TECHNIQUE,
Spectral Imaging, Inc., Concord, Mass.
J. A. Decker, Jr.
Analytical Chemistry, Vol 44, No 2, p 127A-134A, February 1972. 9 fig, 18 ref.

Descriptors: *Spectrometers, *Instrumentation, Laboratory equipment, Chemical analysis, Design, Fourier analysis.
Identifiers: *Hadamard-transform spectrometry, Infrared spectrometers, Multiplexing.

A description is given of the theory and design of a Hadamard-transform infrared spectrometer which achieves the 'multiplex' performance of Fourier-transform-interferometer spectrometers but employs the technology of conventional dispersive (i.e. prism or grating) spectrometers. The technique decreases scanning time, increases sensitivity, and avoids the expense and complexity of typical multiplex instruments. The instrument achieves an advantage in signal-to-noise ratio over a conventional scanning monochromator spectrometer by a factor approximately equal to the square root of the total number of spectral resolution elements in the spectrum by simultaneously observing all the wavelengths present. Multiplexing is achieved by an optical coding process so that the measured data points are the mathematical transform (a binary 'pseudo-noise' transformation based on Hadamard matrices) of the input optical spectrum. The instrument can be used in analytical chemistry like any other infrared spectrometer. (Mackan-Battelle)
W72-09418

RAPID METHODS FOR MEASURING RAIDOACTIVITY IN THE ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 05A.
W72-09437

A SIMPLE APPLICATION OF LEAST--SQUARES FITTING TO GAMMA SPECTROMETRY OF MARINE ENVIRONMENTAL SAMPLES: THE CASE OF CESIUM RADIONUCLIDES,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
For primary bibliographic entry see Field 05A.
W72-09444

RAPID EVALUATION OF RADIOACTIVE SAMPLES BY GAMMA-RAY SPECTROMETRY,
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 05A.
W72-09446

APPLICATION OF LIQUID SCINTILLATION SPECTROMETRY FOR TOTAL BETA AND ALPHA ASSAY,
New York Operations Office (AEC), N.Y. Health and Safety Lab.
For primary bibliographic entry see Field 05A.
W72-09449

CHITIN AND CHITOSAN AS CHROMATOGRAPHIC SUPPORTS AND ABSORBENTS FOR COLLECTION OF METAL IONS FROM ORGANIC AND AQUEOUS SOLUTIONS AND SEA WATER,
M. G. Muzzarelli.
U. S. Patent No. 3,635,818, 5 p, 7 tab, 1 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 3, p 1093, January 18, 1972.

Descriptors: *Patents, *Chromatography, Pollution abatement, Water pollution treatment, Sea water, Chelation, Metals, Water pollution, Waste water (Pollution), Waste water treatment, *Adsorption, Water purification, Separation techniques, Ions.

Identifiers: *Chitin, *Chitosan.

Eleven examples are given to demonstrate the proposed method for collecting ions of transition metals from aqueous solutions and from sea water. The method is to contact the solution with chitin containing at least 7 per cent by weight nitrogen, then stirring and shaking the mass. After the treatment, the chitin is washed with a suitable solution to elute the collected ions. (Sinha-OEIS)
W72-09491

PARTIAL PRESSURE OF GASES DISSOLVED AT GREAT DEPTH,
Rochester Univ., N.Y. Dept. of Physiology.
For primary bibliographic entry see Field 01B.
W72-09537

ION ASSOCIATION AND THE ANALYSIS OF PRECISE CONDUCTIMETRIC DATA,
Reading Univ. (England). Dept. of Chemistry.
E. M. Hanna, A. D. Pethybridge, and J. E. Prue.
Electrochimica Acta, Vol 16, No 6, p 677-686, June 1971. 6 fig, 4 tab, 25 ref.

Descriptors: *Ionization, *Salts, *Aqueous solutions, *Electrolysis, *Conductivity, Mathematical studies, Equations, Sulfates, Analytical techniques.
Identifiers: *Ion association.

At concentrations above about 0.001 M, the conductivities of aqueous solutions of most 1:1 salts show positive deviations from the Debye-Onsager limiting law because of the ion-size effect. The 2:2 sulfates by contrast show large although nonspecific negative deviations, which are usually ascribed to the formation of nonconducting ion pairs between oppositely charged ions which have approached one another sufficiently closely. Measurements of electrolyte solution conductivities can attain a precision not so far reached with colligative or spectrophotometric properties, and recent controversy and progress concerning the correct incorporation of the effect of ion size in the conductivity equation suggests a re-examination of the interpretation of conductivity data for some 2:2 salts in water. The 2:2 salts in water are electrostatically equivalent to 1:1 salts in a solvent with a permittivity one-quarter that of water. The analysis therefore provides a severe test of conductivity equations. (Woodard-USGS)
W72-09544

OCCURRENCE AND DISTRIBUTION OF TRACE ELEMENTS IN NEW JERSEY STREAMS,
Geological Survey, Trenton, N.J.
For primary bibliographic entry see Field 05A.
W72-09545

GROUND-WATER RESOURCES OF CACHE VALLEY, UTAH AND IDAHO,
Geological Survey, Logan, Utah.
For primary bibliographic entry see Field 04B.
W72-09558

SALT SPRAY AND MINERAL CYCLING IN TWO CALIFORNIA COASTAL ECOSYSTEMS,
Forest Service (USDA), Boise, Idaho. Intermountain Forest and Range Experiment Station.
J. L. Clayton.
Ecology, Vol 53, No 1, p 74-81, 1972.

Descriptors: *Cycling nutrients, *Soil-water-plant relationships, *Sea spray, Shoreline cover, Geochemistry, Absorption, Exudation, Tracers, *California, Ecosystems, Ions.
Identifiers: 22Na, *Baccharis pilularis.

The inland migration of salt spray was studied along with its role in the cycling of minerals in two Baccharis brushland-coastal terrace ecosystems in California. Initial ion separation during bubble bursting and subsequent uneven fallout of particulate salts during onshore transport may account for the peculiar ion ratios of salt spray. Plants act as concentration nodes for nutrient ions, and are effective at trapping salt spray. Analyses of soils from the two sites demonstrated nutrient release of ions from litter in the surface; at depth, ionic losses from leaching are evident. Baccharis plants treated foliarly with 22Na exuded 12 percent of the total dose out of their roots into culture solution 25 days after application. This indicates that a possible pathway for salts trapped on plants is by absorption and downward transport througs the plant into the soil. (Forest Service)
W72-09605

BIOGEOCHEMICAL SOURCES OF IODINE AND COBALT IN MOLDAVIA (BIOGEOKHIMICHESKIYE PROVINTSII YODA I KOBALTA V MOLDAVII),
Kishinev Botanical Garden (USSR).
Ya. V. Bumbu.
Akademiya Nauk Moldavskoy SSR, Kishinev, 1971. 128 p.

Descriptors: *Geochemistry, *Biochemistry, *Iodine, *Cobalt, *Trace elements, Soils, Soil groups, Soil types, Crops, Water sources, Human diseases, Animal diseases, Plant diseases, Animal physiology, Plant physiology, Geomorphology, Geographical regions, Physiographic provinces, Investigations, History.
Identifiers: *USSR, *Moldavia, *Biogeochemistry, Geobotany, Reagents.

A study of the biogeochemical sources of iodine and cobalt in the Moldavian SSR was based on extensive investigations of soils, crops, and natural waters in the 4 geobotanical zones of the republic. The purpose of the investigations was to determine the relationship of iodine and cobalt concentrations in these environments to the incidence of certain endemic diseases among humans and animals. A definite parallelism in the iodine and cobalt concentrations in soils, crops, and water sources was established: the highest concentrations of these trace elements were found in soils and the lowest concentrations in the waters. Specific measures for use of iodine and cobalt salts in agriculture and medicine are outlined. (Josefson-USGS)
W72-09643

NITROGEN THERMAL WATERS OF THE USSR (AZOTNYYE TERMY SSSR),
Tsentralnyi Nauchno-Issledovatelskii Institut Kurortologii i Fizioterapii, Moscow (USSR).
For primary bibliographic entry see Field 02F.
W72-09645

DETERMINATION OF NITRILOTRIACETIC ACID IN INLAND WATERS BY GAS CHROMATOGRAPHY OF THE TRIMETHYL ESTER,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05A.
W72-09711

OXIDATION-REDUCTION CONDITIONS IN IRRIGATED SOILS OF THE TASHKENT OASIS (OB OSOBENNOSTYAKH OKISLITEL'NO--VOSSTANOVITEL'NYKH USLOVIY OROSHAYEMYKH POCHV TASHKENTSKOGO OAZISA),
Ministerstvo Selskogo Khozyaistva Uzbek SSR, Tashkent. Institut Pochvovedeniya.
For primary bibliographic entry see Field 03F.
W72-09743

WATER QUALITY RECORDS OF THE SNOWY MOUNTAINS REGION, AUSTRALIA.
Snowy Mountains Hydro-Electric Authority, Cooma (Australia).
For primary bibliographic entry see Field 07C.
W72-09770

2L. Estuaries

NUTRIENT FLUX IN ESTUARIES,
Georgia Univ., Athens. Dept. of Zoology and Georgia Univ., Athens. Computer Center; and Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 05C.
W72-09172

DYNAMICS OF THE FAT CONTENT IN THE BODIES OF MUGIL SALIENS RISSO GROWN IN THE SHABOLATSKY ESTUARY, (IN RUSSIAN),
L. I. Starushenko.
Gidrobiologicheskii Zhurnal. 6 (5): 94-96. 1970.

Descriptors: *Mullets, Fish, Fish physiology, Growth, Growth stages.
Identifiers: Mugil saliens, Shabolatsky Estuary (USSR).

The changes in fat content in M. saliens are divided into 3 periods: 4-5 mo. of pre-winter growth during which average body length increased from 1.6-6.6 cm, weight increased from 0.06-2.5 g, and fat accumulated intensively from 0.56-6.3%; 4.5 mo. of winter during which fat reserves were mobilized; and 6 mo. of protein growth and intensive fat accumulation during which body length reached 22.9 cm and the maximum fat concentration was 15.9%.--Copyright 1972, Biological Abstracts, Inc.
W72-09185

ON THE WATER OF THE CANADIAN ARCTIC ARCHIPELAGO, AN ATLAS PRESENTATION OF 1961 AND 1962 DATA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 07C.
W72-09227

INTERSPECIES CONFLICT IN ESTUARINE COPEPODS,
Western Australia Univ., Nedlands. Dept. of Zoology.
E. P. Hodgkin, and R. J. Rippingale.
Limnology and Oceanography, Vol 16, No 3, p 573-576, 1971. Illus.
Identifiers: Acartia clausi, *Copepods, *Distribution, Estuaries, Gladioferens imparipes, *Predation, Sulcanus conflictus.

Gladioferens imparipes lives in estuarine waters of a wide range of salinity. However, it often has a much more restricted distribution; in the Swan River estuary of Western Australia it is only plentiful in low salinity water. It is seldom present where either of 2 less, euryhaline species, Sulcanus conflictus or Acartia clausi, are abundant. These 2 species prey on young larvae of Gladioferens. When these predators are present in high density, they may eliminate their prey, Gladioferens nauplii. Gladioferens is then restricted to parts of the estuaries where environmental conditions are unfavorable to Sulcanus or Acartia.--Copyright 1972, Biological Abstracts, Inc.
W72-09231

DISTRIBUTION AND COMPOSITION OF CARBONATES IN THE UPPER LAYER OF BOTTOM SEDIMENTS OF THE ATLANTIC OCEAN (RASPREDELENIVE I SOSTAV KARBONATOV V VERKHNEM SLOYE DONNYKH OSADKOV ATLANTICHESKOGO OKEANA),
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W72-09256

BOMEX TEMPORARY ARCHIVE DESCRIPTION OF AVAILABLE DATA,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Science and Technology.
For primary bibliographic entry see Field 07C.
W72-09263

GROUNDWATER FLOW IN CALCAREOUS AQUIFERS IN THE VICINITY OF BARCELONA, SPAIN,
Groundwater Research Center, Jerusalem (Israel).
For primary bibliographic entry see Field 02F.
W72-09277

DETERMINATION OF THE ZONE OF ORIGIN OF TSUNAMIS (OPREDELENIYE MESTA VOZNIKNOVENIYA TSUNAMI),
V. A. Karyakin.
Gidrometeoizdat, Leningrad, 1971. 102 p.

Descriptors: *Tsunamis, *Waves (Water), *Ocean waves, *Earthquakes, *Seismic studies, Seismic waves, Seismographs, Warning systems, Forecasting, Probability, Travel time, Height, Depth, Bathymetry, Acoustics, Hydrography, Surveys, Digital computers, Mathematics, Equations.
Identifiers: *USSR, Epicenters, Aftershocks, Marigraphs, Isobaths, Orthodromy.

Techniques for determining the zone of origin of tsunamis were based on marigraphic and bathymetric observations. The problem of determining tsunami generation was solved for cases where seismic data were available on the epicentral area of submarine earthquakes and where no seismic data were available. Formulas are given for (1) determining the location and time of commencement of tsunamis; (2) computing the heights and velocities of propagation of tsunamis; (3) predicting the travel times of tsunamis; and (4) calculating the probability of coincidence of tsunami centers with submarine earthquake-epicenters. (Josefson-USGS)
W72-09280

HISTORY OF THE WORLD'S OCEANS (ISTORIYA MIROVOGO OKEANA).

Izdatel'stvo 'Nauka', Moscow, Zenkevich, L.A., editor-in-chief, 1971. 288 p.

Descriptors: *Oceanography, *Oceans, *Sediments, *Sedimentation, *Marine geology, Structural geology, Continental shelf, Continental slope, Biology, Aquatic life, Marine animals, Geochemistry, Mineralogy, Geologic time, Sea water, Pacific Ocean, Indian Ocean, Arctic Ocean, Atlantic Ocean, History.
Identifiers: *USSR, Ocean basins, Oceanogenic sedimentation, Tectonics, Geosynclines, Continental rise, Continental drift, Mid-oceanic islands, Phosphorites, Pelagic.

This monograph contains the most important papers presented at the Conference on the History of the World's Oceans, organized by the Earth Sciences Section of the USSR Academy of Sciences under sponsorship of the Moscow Society of Naturalists (December 1-4, 1969), and at the Symposium on Deep-Sea Sediments, arranged by the Commission on Sedimentary Rocks of the Department of Geology, Geophysics, and Geochemistry of the USSR Academy of Sciences (December 15-17, 1969). The subject material is divided into two parts: geological, biological and geochemical aspects of the oceans' history (9 papers); and deep-sea ocean sediments (10 papers). Specific topics examined include: (1) origin of primary and secondary ocean basins; (2) role of ocean formation in the tectonic evolution of the earth; (3) age and origin of oceans; (4) age and evolution of deep-sea fauna; (5) evolution of the chemical composition of sea water; (6) sedimentary formations of oceans; (7) sedimentation in present-day geosynclinal belts of the Pacific; (8) sediments in volcanic rift zones of mid-Indian Ocean ridges; (9) deep-sea sediments of the Arctic Ocean; (10) formation of the mineral composition of deep-sea sediments; (11) distribution of clay minerals in ocean sediments; (12) phosphorite deposits on the ocean floor; (13) deep-sea ore sediments of hydrothermal origin; and (14) deep-sea sediments of folded regions. (Josefson-USGS)
W72-09282

THE MANGROVE SWAMP AND SALT MARSH COMMUNITIES OF THE SYDNEY DISTRICT. IV. THE SIGNIFICANCE OF SPECIES INTERACTION,
New South Wales Univ., Kensington (Australia). School of Botany.
L. D. Clarke, and N. J. Hannon.
Journal of Ecology, Vol 59, No 2, p 535-553. 1971.
Identifiers: Allelopathy, Arthrocnemum australasicum D, Australia, Avicennia marina D, Casuarina glauca D, Communities, Growth, Interaction, Juncus maritimus M, Light, *Salt marshes, Salinity, Species, *Mangrove swamps, Sydney, Saturated soils, *Population.

Species interactions-via phytoxic exudates, shading and associated growth were investigated to assess their roles in causing the sharp zonation that often occurs between the dominant species of the Sydney mangrove and salt marsh communities. The growth of Arthrocnemum australasicum was reduced and its mortality was increased in association with Avicennia marina or Juncus maritimus. No evidence of inhibition of Arthrocnemum by leachates or macerates of mangrove bark, leaves or soil was found, but the higher light requirement of all the species of the Arthrocnemum zone, compared with Avicennia or Juncus, would prevent their migration into the adjacent zones where these other species are dominant. No reciprocal diminution in growth or survival of Avicennia or Juncus occurred when in association with Arthrocnemum. Survival and growth of seedlings of both Casuarina glauca and Juncus were inhibited by the presence of a layer of Casuarina litter on the soil surface but not by leachates or macerates of fresh Casuarina cladodes or Casuarina litter. The biotic factor exerts an important influence on species distribution in these communities, as does salinity and waterlogging. The growth in association of dominant species from each zone along an artificial gradient of elevation, salinity, soil and waterlogging produced a species zonation pattern which closely resembled the zonation pattern that occurs in the field. An assessment is made of the factors restricting the landward and seaward migration of all the prominent species in these communities under present conditions.--Copyright 1972, Biological Abstracts, Inc.
W72-09286

THE STRUCTURE OF THE SPECIES POPULATIONS IN THE INITIAL STAGES OF SALT--MARSH SUCCESSION,
Foras Taluntais, Wexford (Ireland).
For primary bibliographic entry see Field 04A.
W72-09288

ANALOG MODELING TO DETERMINE THE FRESH WATER AVAILABILITY ON THE OUTER BANKS OF NORTH CAROLINA,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 04B.
W72-09297

A THREE-DIMENSIONAL CURRENT METER FOR ESTUARINE APPLICATIONS,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
W. J. Wiseman, Jr., R. M. Crosby, and D. W. Pritchard.
Journal of Marine Research, Vol. 30, No. 1, p 153-158, January 15, 1972. 1 fig, 8 ref.

Descriptors: *Instrumentation, *Current meters, *Estuaries, Monitoring, Velocity, Flow rates, Water yield, Fluctuations.
Identifiers: Particulate matter, Doppler shift, Vector analysis.

An acoustic doppler-shift current meter capable of sensing high-frequency velocities typically found in estuaries was developed. The design criteria were: (1) rapid response time; (2) output data as true vector averages of three-dimension velocity; and (3) remote sensing of velocity to minimize disturbance to the field of flow. Sound, emitted from a transmitter and scattered in three independent directions by particulate matter moving with the ambient fluids velocity, is recorded and doppler shifts in frequency relative to the transmitted sound are measured. Shift data allow determination of the velocity vector at the intersection of the transmitters' and the receivers' beam patterns. Information is fed to signal processing equipment through underwater cables. The meter has been used in the field with moderate success when mean fluid velocity was about 20 cm/sec. At high velocities, accuracy of better than 3 percent has been obtained. The advantages of the meter over similar meters are: sampling without disturbing sampled fluid, taking a vector average, and, most important, simultaneous measuring all of the three components of fluid velocity. (Mackan-Battelle)
W72-09334

FALLOUT CESIUM-137 IN CLAMS (RANGIA CUNEATA) FROM THE NEUSE RIVER ESTUARY, NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05A.
W72-09337

DETERMINATION OF NANOMOLAR QUANTITIES OF FREE AMINO ACIDS DISSOLVED IN NORTH ATLANTIC OCEAN WATERS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05A.
W72-09343

THE RELATIVE IMPORTANCE OF FRESHWATER INPUT, TEMPERATURE AND TIDAL RANGE IN DETERMINING LEVELS OF DISSOLVED OXYGEN IN A POLLUTED ESTUARY,
Clyde River Purification Board, East Kilbride (Scotland).
For primary bibliographic entry see Field 05B.
W72-09345

DISTRIBUTION OF CERTAIN HETEROTROPHIC AEROBIC BACTERIA IN EASTERN MEDITERRANEAN DEEP-SEA SEDIMENTS, (DISTRIBUTION DE CERTAINES BACTERIES HETEROTROPHES AEROBIED DANS LES SEDIMENTS PROFONDS DE MEDITERRANEE ORIENTALE),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 05C.
W72-09349

THE SEASONAL SELECTION BY TEMPERATURE OF HETEROTROPHIC BACTERIA IN AN INTERTIDAL SEDIMENT,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 05C.
W72-09350

CONTRIBUTION OF THE STUDY OF ZOOPLANKTON IN LEBANESE WATERS, (CONTRIBUTION A L' ETUDE DU ZOOPLANCTON DES EAUX LIBANAISES),
Lebanese Univ., Beirut. Faculty of Sciences.
For primary bibliographic entry see Field 05A.
W72-09355

ECOLOGY AND LIFE HISTORY OF THE DIAMOND KILLIFISH: ADINIA XENICA (JORDAN AND GILBERT),
Florida State Univ., Tallahassee. Dept. of Biological Science.
R. W. Hastings, and R. W. Yerger.
American Midland Naturalist. No. 2, Vol 86, p 276-291. 1971.
Identifiers: Adinia xenica, Behavior, Birds, Breeding, Copepods, Crustaceans, Ecology, Food, Habit, *Killifishes, Nematodes, Parasites, Predation, Trematodes, Vegetation, *Life history studies.

A. xenica occurs in estuarine areas of the northern Gulf of Mexico from southeastern Florida to the central coast of Texas. It is most often found in shallow waters of medium salinity in areas of abundant vegetation, with other cyprinodontids and poeciliids normally expected in a brackish-water habitat. Adinia is prey to piscivorous birds and is parasitized by nematodes, trematodes and copepods. Defensive behavior includes darting to the bottom in deeper water or resting motionless in the shallowest water at the edges, usually in areas of abundant vegetation. There is little schooling tendency in Adinia, although unorganized aggregations of individuals may form under certain conditions. A possible symbiotic relationship exists in which Adinia 'tail-stands' to solicit cleaning behavior from other organisms. Food consists primarily of plant and animal material which is picked from submerged plant stalks or which falls into or floats on the surface of the water. Small crustaceans are the most common food item. Adinia attains sexual maturity at about 19 or 20 mm. Males outnumber females 2 to 1. Most, if not all, breeding activity occurs from March through Aug. or Sept. Sexual dimorphism is always apparent; the males are larger and more compressed, have longer fins and brighter colors and possess contact organs. Eggs are deposited singly on the submerged stalks of plants. Males actively pursue females, and combat often occurs between two males pursuing the same female. Eggs normally hatch in about 2 weeks. Newly-hatched individuals are marked with dorsal, lateral, and ventral stripes of melanophores. Fin rays are well-developed in the caudal and pectoral fins and may also be presented in the anal fin fold. Scales and pelvic fins are visible after 20 days. The adult body form is attained after about 30 days.--Copyright 1972, Biological Abstracts, Inc.
W72-09360

RELEASE OF DISSOLVED ORGANIC MATTER FROM NATURAL POPULATIONS OF MARINE PHYTOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W72-05363

MATHEMATICAL MODEL FOR FATE OF POLLUTANTS IN NEAR-SHORE WATERS,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 05B.
W72-09377

AUTOMATIC MONITORING METHOD USING BIOLOGICAL CONCENTRATION FOR MARINE RADIOACTIVE CONTAMINATION,
Tokyo Univ. (Japan). Fisheries Inst.
For primary bibliographic entry see Field 05A.
W72-09454

RADIOACTIVE AND METALLIC (COPPER AND ZINC) POLLUTANTS IN THE SCHELDT ESTUARY (IN WATER, SEDIMENT AND SUSPENDED MATTER), (LES POLLUANTS RADIOACTIFS ET METALLIQUES (CUIVRE ET ZINC) DANS L'ESTUAIRE DE L'ESCAUT (EAUX, SEDIMENTS ET MATIERES EN SUSPENSION)),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 05A.
W72-09455

HURRICANE PROTECTION PROJECT, STRATFORD, CONNECTICUT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 08D.
W72-09478

METHOD AND APPARATUS FOR DESILTING AND/OR DESALTING BODIES OF WATER,
For primary bibliographic entry see Field 04A.
W72-09504

PROCEEDINGS, 1971 TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.
Oregon State Univ., Corvallis. Engineering Experiment Station.
For primary bibliographic entry see Field 05B.
W72-09547

THE POTENTIAL OF PHYSICAL MODELS TO INVESTIGATE ESTUARINE WATER QUALITY PROBLEMS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-09548

APPLICATIONS OF SOME NUMERICAL MODELS TO PACIFIC NORTHWEST ESTUARIES,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05B.
W72-09549

STUDIES OF SEDIMENT TRANSPORT IN THE COLUMBIA RIVER ESTUARY,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 05B.
W72-09551

DESIGN AND CONSTRUCTION OF A SALT-WATER ENVIRONMENT SIMULATOR,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W72-09553

SALINITY, RUNOFF AND WIND MEASUREMENTS, YAQUINA ESTUARY, OREGON,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W72-09554

CAPE COD BAY ECOSYSTEM QUANTITATIVE ANALYSIS,
Marine Biological Lab., Woods Hole, Mass. Systematics-Ecology Program.
D. K. Young, K. D. Hobson, J. S. O'Conner, A. D. Michael, and M. A. Mills.
Available from the National Technical Information Service as AD-732 791, $3.00 in paper copy, $0.95 in microfiche. September 1971. 71 p, 18 fig, 6 tab, 56 ref. Project NR 104-835, Contract NONR 3070 (03).

Descriptors: *Ecosystems, *Sampling, *Equipment, *Benthic fauna, *Estuarine environment, *Animals, Marine animals, *Sediment distribution, Invertebrates, Analytical techniques, Numerical analysis, Distribution patterns, Mollusks, Amphipoda, Annelids, Carnivores, Oligochaetes, Turbidity, Sediments, Massachusetts, Herbivores, Temperature, Statistical methods, Systematics, Isotherms, Profiles, Particle size, Mechanical equipment, Distribution patterns, Population.
Identifiers: *Quantitative analysis, Epibenthic sled, Naturalist dredge, Clam dredge, Smith-McIntyre grab, *Cape Cod Bay, Multivariate analysis, Polychaetes, Suspension feeders, Molpaida oolitica, Macroinvertebrates, Tmetonyx, Maera, Data interpretation, Species diversity, Nephtys incisa, Goniada maculata, Ninoe nigripes, Aricidea quadrilobata, Paraonis gracilis, Lumbrineris fragilis, Aricidea jeffreysii.

Intensive sampling, sorting, and identification of benthos of Cape Cod Bay to 1 mm size were undertaken in 1965 to provide information on the structure of the subtidal benthic community relative to sediment type, turbidity, temperature, salinity, and depth. Sampling was done with the epibenthic sled, naturalist dredge, clam dredge, and Smith-McIntyre grab at equally spaced stations throughout the Bay and the year. Analyses of data on the biota, environmental factors, and sampling gear were facilitated by computer. Preliminary analyses were restricted to oligochaetes, amphipods, molluscs, and 14 families of polychaetes in 91 Smith-McIntyre samples evenly spaced throughout the Bay. The total abundance of benthic animals considered was lowest at depths of water exceeding 30 m, and highest (5000/m2) at intermediate depths of 20-30 m. Polychaetes were by far the most abundant taxonomic group present. Most of the benthos were infauna which build tubes, but free burrowing infauna were also abundant particularly in shallow sediments with low percentages of clay, or silt, or both. Summer concentrations of molluscs and polychaetes were appreciably greater than winter concentrations in shallow waters. Species diversity of individual samples was essentially identical at all depths. However, if samples are combined to assess diversity over larger areas, species diversity appeared to decrease with increasing depth and with sediment homogeneity. Multivariate analysis of the dominant amphipod species indicate that depth and type of sediment are the major determinants of species associations. (Holoman-Battelle)
W72-09573

BIOLUMINESCENCE AND PRIMARY PRODUCTIVITY IN MARINE ESTUARINE ENVIRONMENTS,
Johns Hopkins University, Baltimore, Md. McCollum-Pratt Inst.
For primary bibliographic entry see Field 05C.
W72-09575

TRACE ELEMENT CONCENTRATIONS IN SOME MODERN CORALS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W72-09577

A GUIDE TO THE GEOLOGY OF DELAWARE'S COASTAL ENVIRONMENTS,
Delaware Univ., Newark. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W72-09614

RIVER AND COASTAL ICE PROBLEMS IN ICELAND,
National Energy Authority, Reykjavik (Iceland).
For primary bibliographic entry see Field 02C.
W72-09624

POSSIBLE EFFECTS OF ORGANOCHLORINE PESTICIDES ON PRIMARY PRODUCTIVITY AND SKELETOGENESIS OF NEW ENGLAND ESTUARINE AND COASTAL MARINE ALGAE,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W72-09653

PHOSPHORUS AND EUTROPHICATION IN THE PAMLICO RIVER ESTUARY, N. C., 1966--1969 - A SUMMARY,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 05C.

W72-09655

CATCHES OF POSTLARVAL WHITE SHRIMP, 'PENAEUS SETIFERUS' (LINN.), AND BROWN SHRIMP, P. AZTECUS IVES, AND TEMPERATURE AND SALINITY OBSERVATIONS IN VERMILION BAY, LOUISIANA, MARCH 1963 TO APRIL 1967,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
C. W. Caillouet, Jr., B. J. Fontenot, Jr., W. S. Perret, R. J. Dugas, and H. F. Hebert.
Available from the National Technical Information Service as Com-71-01055, $3.00 in paper copy, $0.95 in microfiche. National Marine Fisheries Service Data Report 64, July 1971. 42 p, 1 fig, 10 tab, 9 ref. Contract No. 14-17-0002-48.

Descriptors: *Water temperature, *Salinity, *Trawling, Water analysis, Plankton nets, Louisiana, Environmental effects, Bays, Data processing, Estuaries, Streams, Coastal marshes, Chlorine, Sampling.
Identifiers: *Penaeus setiferus, Ctenophores, Sodium tetraborate decahydrate, Brown shrimp, White shrimp, Cote, Glyceral, Daylight, Sample preservation, FAC National Marine Fisheries Service, FAC Louisiana Wildlife and Fisheries Commission.

Trawl samples of shrimp were taken from eight sites in the Vermilion Bay area of Louisiana from March 1963, to April 1967, to develop indices of relative abundance of white and brown shrimp and to try to relate the indices to shrimping success in the area. Data on the catches are included; however, no analyses are included. (Snyder-Battelle)
W72-09674

MALACOLOGICAL RESOURCES OF THE GULF OF SAN MATIAS WITH SOME OBSERVATIONS MADE IN THE EXPLORATORY CAMPAIGN SAO-I-71,
Instituto de Biologia Marina, Mar del Plata (Argentina).
S. R. Oliver, R. O. Marziale, and R. Capitoli.
Inst Biol Mar (Mar Del Plata) Contrib. 162. p 1-21. 1971. Illus. Maps.
Identifiers: Amiantis purpurata, Argentina, Chlamys tehuelca, Mala cology, Ostrea puelchana, Ostrea spreta, Resources, *Gulf of San Matias, Sao-1-71, *Mollusks.

A rich fauna of molluscs inhabits the Gulf of San Matias (Argentina), and some of its representatives have great actual or potential importance. It includes 10 spp. of Pelecypoda, 3 of Cephalopoda and 2 Gastropoda. The port of San Antonio Oeste has become the principal Argentine fishing port for these species. Several large banks of shellfish were located. A very large number of species are listed, including Ostrea puelchana, O. spreta, Amiantis purpurata, Chlamys tehuelca. Copyright 1971, Biological Abstracts, Inc.
W72-09708

INSIDIOUS ALTERATION OF THE ESTUARINE ENVIRONMENT,
Miami Univ., Fla. Inst. of Marine Sciences.
For primary bibliographic entry see Field 05C.
W72-09717

DISTRIBUTIONAL TRENDS IN THE RECENT MARINE SEDIMENTS OF NORTHERN BAFFIN BAY,
Bedford Inst., Dartmouth (Nova Scotia). Marine Geology.
A. C. Grant.
Maritime Sediments, Vol 7, No 2, p 41-63, September 1971. 16 fig, 2 tab, 30 ref.

Descriptors: *Sedimentation, *Provenance, *Sediment transport, Canada, Icebergs, Sediment sorting, Sedimentology, Bottom sediments.
Identifiers: *Baffin Bay.

The nature of the Recent sediments in northern Baffin Bay, and their textural properties relative to water depth, bottom configuration, and the agents responsible for their transport were studied by analyzing 69 samples. Auxiliary lines of research included determination of the organic matter and calcium carbonate content of the sediments, and evaluation of the lithology and abrasion of the gravel-size material. The gravel content is highest in a zone approximately coincident with the paths of surface currents. Distribution on the basis of median grain diameters illustrates shoreward progression from fine to coarse sediment, and clay deposition in nearshore bottom depressions. Offshore sand accumulations occur on topographically high parts of the basin floor. Carbonate distribution relates primarily to regional geology and to water circulation, and gravel lithology reflects similar control. Ice-rafting is the dominant agent of sediment transport in the Baffin Bay region. Ice movement is confined mainly to the lateral zone of surface currents, and gravel distribution in the bottom sediment is determined accordingly. The distribution of finer sediments depends upon hydraulic conditions. Clay accumulates in the central, deep-water area, but may also be deposited within the gravel zone where the bottom water is undisturbed by current action. Where water movement affects the bottom, sorting of the sediment occurs by virtue of non-deposition of fine particles. (Knapp-USGS)
W72-09763

THE WATER ECONOMY OF THE SEA GRASS THALASSIA TESTUDINUM,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
F. Gessner.
Mar Biol, Vol 10, No 3, p 258-260. 1971. Illus.
Identifiers: Cuticle, Deficit, Economy, Electron microscopy, *Sea Grass M, *Thalassia-Testudinum-M, *Transpiration, *Osmotic pressure.

The osmotic values in the leaves of T. testudinum Banks ex Konig, collected from the natural habitat, were found to be 32 atm; the relative transpiration was 100%. Electronmicroscopical analysis of the cuticle reveals many perforations. The critical sublethal water deficit lies near 65%. In dense meadows the green surface area of the plants amounts to 18.56 m2/m2 bottom area.--Copyright 1972, Biological Abstracts, Inc.
W72-09784

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THE POTENTIAL CONTRIBUTION OF DESALTING TO FUTURE WATER SUPPLY IN NEW MEXICO,
Southwest Research Inst., San Antonio, Tex.
D. E. Morris, and W. L. Prehn, Jr.
Prepared for the Office of Saline Water and the Office of the State Engineer, State of New Mexico, Santa Fe, March 1971. 164 p, 22 fig, 48 tab, 76 ref. OSW 14-30-2580.

Descriptors: *Desalination plants, *Desalination processes, *Brine disposal, *New Mexico, *Water quality control, Desalination, Ion exchange, Electrodialysis, Reverse osmosis, Vapor compression distillation, Flash distillation, Planning, Water supply, Municipal water, Water costs, Waste water disposal, Local governments.
Identifiers: *Gallup, *Artesia, Zuni Pueblo, Tularosa, Moriarty.

A statewide study was made of the technical and economic feasibility of desalting in selected New Mexico communities. Five communities were chosen for study on the basis of present or deteriorating water quality of present supply and the impracticability of providing improved quality from alternative sources. These communities were: Artesia, Gallup, Moriarty, Tularosa and Zuni Pueblo. Essentially, all local conditions were taken into account in order to determine, through calculation of various desalt process applications, whether or not desalting could effect water quality improvement under acceptable economic conditions. Calculations were made for each city for five desalting processes including: electrodialysis, reverse osmosis, ion exchange, vacuum freezing-vapor compression, and vapor compression-vertical tube evaporator-multistage flash distillation. Conceptual plant layouts were made for each study community, and the desalt plant was located in each on the basis of providing least cost product water. Blending of desalted water with feedwater or other water was assumed where feasible to lower the cost of delivered water. Brine disposal was calculated assuming blending with sewage effluents, with the remainder sent to evaporation ponds. Both desalting and brine disposal cost calculation procedures are discussed. (Poertner)
W72-09306

VARIABLE ORIFICE FOR MULTISTAGE FLASH EVAPORATION OR DISTILLATION UNITS,
Department of the Interior, Washington, D.C.; and Secretary of the Interior, Washington, D.C. (Assignee).
R. Van Winkle.
U. S. Patent No. 3,634,199, 2 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 2, p 713, January 11, 1972.

Descriptors: *Patents, *Desalination, *Distillation, *Flash distillation, Evaporation, Freshwater, Flow control, Potable water.

The variable orifice is a device for controlling the horizontal flow of fluids between adjacent, generally horizontal flash evaporator stages. The distill and flows under decreasing temperature and pressure from one stage to the next. The fluid flow is controlled by a vapor-impermeable, flexible or hinged flap. If the force applied to the flap is greater than the interstage pressure differential, the flap dips down into the distill and acts to regulate the flow. (Sinha-OEIS)
W72-09487

CHITIN AND CHITOSAN AS CHROMATOGRAPHIC SUPPORTS AND ABSORBENTS FOR COLLECTION OF METAL IONS FROM ORGANIC AND AQUEOUS SOLUTIONS AND SEA WATER,
For primary bibliographic entry see Field 02K.
W72-09491

EVAPORATION-REVERSE OSMOSIS WATER DESALINATION SYSTEM,
Stone and Webster Engineering Corp., Boston, Mass. (Assignee).
H. E. Nelson.
U. S. Patent No. 3,632,505, 2 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 894, No 1, p 305, January 4, 1972.

Descriptors: *Patents, *Desalination, *Evaporation, *Reverse osmosis, Sea water, Potable water, Brine, Water treatment, Equipment, Heat exchangers, Evaporators, Separation techniques.

The apparatus consists of an evaporator used for receiving the feed water and discharging the distillate, a reverse osmosis system, and a device for heat exchange. The power to operate both the evaporator and the reverse osmosis units is provided by a steam generator. A turbo generator is supplied with high pressure steam and in turn provides electric power for driving the pumps in the reverse osmosis system. (Sinha-OEIS)
W72-09506

INSTRUMENTATION FOR IN-SITU DETERMINATION OF ICE PARTICLE SIZE DISTRIBUTION,
North American Rockwell Corp., Canoga Park, Calif. Rocketdyne Div.
G. R. Schneider.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.60. Office of Saline Water, R and D Progress Report No 770, OSW 14-01-0001-2156, April 1972, 51 p, 15 fig, 7 tab, 5 ref.

Descriptors: *Desalination, *Freezing, *Ice, *Instrumentation, *Particle size.
Identifiers: *Particle size analyzer, Crystallizer.

An automatic particle size analyzer, composed of a light-scattering apparatus as a sensor, a pulse converter for signal processing, a pulse height analyzer for signal sorting and storage, an X-Y recorder, and a serial printer for data readout, were assembled, modified where necessary, and calibrated to determine the size distribution of ice particles from freeze desalinators. A calibration was performed using sieved samples of KH2PO4 in trichloroethylene as an ice-brine simulant. Using glass spheres in various liquids, a calibration correction was worked out, enabling the automatic particle size analyzer calibration to be used over a range of particle-to-liquid refractive index ratios extending from 0.93 to 1.13. Tests conducted with sieved samples of sucrose and NaCl in bromobenzene verified the validity of the calibration curve. Further tests indicated the agreement of the comparison between automatically determined size distributions of ice-brine mixtures and manual determinations using the photographic technique was quite good. The automatic particle size analyzer appeared to detect more small particles than did the photographic method. (OSW)
W72-09513

PREPARATION OF REVERSE-OSMOSIS MEMBRANES BY SURFACE MODIFICATION OF POLYMERIC FILMS,
IIT Research Inst., Chicago, Ill.
A. M. Stake, C. Giori, and J. J. Hillman.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.65. Office of Saline Water, R and D Progress Report No 768, OSW 14-30-2750, April 1972, 64 p, 4 fig, 22 tab, 19 ref.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, *Biological membranes, *Semipermeable membranes, Polymers.
Identifiers: *Hollow fibers, *Polymer synthesis, *Vinyl peptides, *Polyphosphonyl ureas, *Polysulfonamides, *Crosslinking, *Polyamides.

A broad variety of polymeric structures were investigated for use in the fabrication of reverse osmosis membranes. Surface acetylation of cellophane resulted in membranes having high salt rejection and low water flux. Crosslinking of collagen and nylon also resulted in low flux membranes having improved salt rejection characteristics. New polymeric systems, such as polyphosphonyl ureas, polysulfonamides and vinylpeptide copolymers, were also evaluated for potential use as reverse osmosis membranes. (OSW)
W72-09514

DESALINATION BY HIGH PRESSURE SOLIDIFICATION OF WATER TO ICE VI,
Clarkson Coll. of Technology, Potsdam, N. Y.
H. H. G. Jellinek.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.35. Office of Saline Water, R and D Progress Report No 765, OSW 14-01-0001-1789, March 1972, 26 p, 1 tab, 9 fig, 4 ref.

Descriptors: *Desalination processes, *Ice, *High pressure.
Identifiers: *Ice VI.

A new method of desalination was investigated which appears promising. The technique consists of subjecting saline water to pressures of about 104 atm. at ambient temperatures. Part of the saline solution is converted to Ice VI. On releasing the pressure the water substance contained in Ice VI is separated from the mother liquor to yield fresh water. The high pressure method is in principle as efficient as any other isothermal process (e.g. reverse osmosis). Present day engineering is capable of producing sufficiently large units for the practical utilization of this method. (OSW)
W72-09516

DEVELOPMENT OF CELLULOSE TRIACETATE HOLLOW FIBER REVERSE OSMOSIS MODULES FOR BRACKISH WATER DESALINATION,
Dow Chemical Co., Walnut Creek, Calif. Western Div. Research Labs.
E. L. Dance, T. E. Davis, H. I. Mahon, E. A. McLain, and W. E. Skiens.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $1.25. Office of Saline Water, R and D Progress Report 763. OSW 14-01-0001-2248, December 1971. 114 p, 46 fig, 22 tab.

Descriptors: *Desalination processes, *Reverse Osmosis, *Desalination apparatus, Membranes, South Dakota, Arizona, On-site tests, Brackish water.
Identifiers: Hollow fiber membranes, Semipermeable membranes, Triacetate hollow fiber membranes, Hollow fiber modules.

A family of melt spun cellulose triacetate base hollow fine fibers for brackish water desalination was developed and evaluated in a series of pilot RO modules. Extended field testing on natural brackish waters have shown these units to possess excellent flux and rejection stabilities at 600 psi operating pressure. After 1500 hours of operation on a Webster, South Dakota, 1600 ppm, high hardness water, a representative 800 gpd pilot unit was still producing a flux of 1.49 gfd (normalized to 25C) and a salt rejection of 98% at a recovery of 52%. Similar results were recorded for a pilot unit tested at Yuma, Arizona. The fibers of nominally 60 microns OD x 30 microns ID were oriented axially in the cylindrical pressure housing. Feed water flow, as established by a hydraulic analysis which supplemented the initial design, was normal to the fiber axis. A number of critical steps in the development of a satisfactory cellulose triacetate hollow fiber were analyzed. These included: (1) polymer selection; (2) spinning; (3) fiber evaluation; and (4) cartridge fabrication. (OSW)
W72-09517

EVALUATION OF SINGLE AND MULTIPLE PASS SEAWATER DESALINATION.
Envirogenics Co., El Monte, Calif.; and Aerojet-General Corp., El Monte, Calif.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $1.00. Office of Saline Water, R and D Progress Report No 762, December 1971. 98 p, 31 fig, 26 tab, 7 ref, append. OSW 14-30-2682.

Descriptors: *Reverse osmosis, *Desalination processes, *Costs, *Economics, Membrane processes.
Identifiers: *Sea water economics, *Tubular reverse osmosis module, *Cost-effectiveness, *Single pass desalination, *Multiple pass desalination.

A parametric cost effectiveness study was undertaken to determine the comparative merits of single and two stage reverse osmosis seawater conversion. The study was based on tubular configurations of current design. Consideration was given to the use of electrodialysis as an alternate to reverse osmosis in the second stage. For the state-of-the-art tubular geometry studied, the two-pass configuration was the least expensive (82 cents/1000 gallons for the 10 Mgd reference plant) when operation was limited to 1500 psig. For 2000 psig operation, there appeared to be little difference in cost between a one-pass and two-pass configuration. Costs for the RO-ED hybrid plant were found to be nearly the same as those for single pass state-of-the-art tubular RO - 84 cents/1000 gallons. For advanced membranes, 60 cents/1000 gallons in a single pass configuration has been projected as reasonably achievable. Substantial improvement is expected in the economics of RO seawater conversion as hollow fine fiber and spiral wound module configurations become more amenable to seawater applications. (OSW)
W72-09518

3B. Water Yield Improvement

SOME ECONOMIC ASPECTS OF RAIN STIMULATION,
RAND Corp., Santa Monica, Calif.
R. R. Rapp.
Available from the National Technical Information Service as AD-731 252, $3.00 in paper copy, $0.95 in microfiche. December, 1970. 13 p, 3 fig, 1 tab, 4 ref.

Descriptors: *Rainfall, *Weather modification, *Economic feasibility, Economic efficiency, Rainfall disposition, Weather forecasting, Water yield improvement.
Identifiers: *Rainfall stimulation.

Some of the possible benefits and detriments of rainfall stimulation are demonstrated within the framework of a hypothetical river basin. The study suggests that a rainfall stimulation program will not be very helpful in those years when it is normally dry. A small increment of water could be added, but it will usually be considerably less than the amount needed. Also, rainfall augmentation projects must be coupled with an understanding of the weather processes and adequate forecasting. Accurate forecasts are needed if one is to know whether to induce precipitation or leave nature to its own devices. Rainfall augmentation will be used in exactly the same manner that the natural precipitation is used. That is, there must be storage and distribution facilities. The additional water will require the development of additional storage. In some marginal areas, such as Israel, where efficient use is currently being made of the natural precipitation, a rainfall augmentation program might be profitable. However, a country must be prepared to utilize any additional water which is produced and to operate the rainfall enhancement program efficiently if that potential profitability is to be realized. (Settle-Wisconsin)
W72-09146

STATUS OF WEATHER MODIFICATION IN WATERSHED MANAGEMENT,
Fresno State Coll. Foundation, Calif. Atmospheric Water Resources Research.
M. C. Williams.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR4, p 585-600, Dec 1971. 6 fig, 2 tab, 16 ref, append.

Descriptors: *Weather modification, *Watershed management, *Water resources development, Cloud seeding, Water sources, Snowmelt, Runoff, Precipitation (Atmospheric), Water management (Applied), Water supply, Groundwater recharge, California, Bibliographies, Artificial precipitation.
Identifiers: Kings River (Calif), Orographic clouds, Supplemental water.

Water resource developments in the State of California involve a wide range of activities designed to meet increasing needs. These activities include both research and water-producing weather modification to supplemental natural supplies. These activities have demonstrated, over a significant period of time, that 5 to 10% increases

in average annual runoff can be achieved. Recent advances indicate that increases of 20 to 50% may be achieved in the future. Watershed management practices for the Kings River, typical of the San Joaquin Valley of California, show the significance of these increases. The application of weather modification as an integral part of watershed management practices represents a significant step toward providing clean water for water-deficient areas. (USBR)
W72-09189

STRUCTURE AND MODIFICATION OF CLOUDS AND FOGS,
State Univ. of New York, Albany. Research Foundation.
For primary bibliographic entry see Field 02B.
W72-09201

EXPERIMENTS ON THE GENERATION OF RAINDROP-SIZE DISTRIBUTIONS BY DROP BREAKUP,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 02B.
W72-09203

FIELD-ENHANCED PROPAGATION OF POSITIVE STREAMERS AND IMPLICATIONS TO ELECTRICALLY INFLUENCED DROPLET COALESCENCE,
State Univ. of New York, Albany.
For primary bibliographic entry see Field 02B.
W72-09213

SUBMICROSCOPIC AEROSOLS FROM ELECTRICALLY STRESSED WATER SURFACES,
State Univ. of New York, Albany.
For primary bibliographic entry see Field 02B.
W72-09214

EFFECT OF ELECTRIC FIELD ON CHARGE SEPARATION BY THE FALLING PRECIPITATION MECHANISM IN THUNDERCLOUDS,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 02B.
W72-09215

MINIATURE WHIRLWINDS PRODUCED IN THE LABORATORY BY HIGH-VOLTAGE ELECTRICAL DISCHARGES,
State Univ. of New York, Albany.
For primary bibliographic entry see Field 02B.
W72-09216

MOUNTAIN-PEAK POTENTIAL-GRADIENT MEASUREMENTS AND THE ANDES GLOW,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 02B.
W72-09219

CONSIDERATIONS REGARDING SOLAR AND LUNAR MODULATION OF GEOPHYSICAL PARAMETERS, ATMOSPHERIC ELECTRICITY AND THUNDERSTORMS,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 02B.
W72-09221

WATER BUDGET ANALYSIS OF A NEW ENGLAND WETLAND,
New Hampshire Univ., Durham. Dept. of Soil and Water Science.
R. J. Rutherford.
M Sc Thesis, June 1971. 43 p, 5 fig, 5 tab, 13 ref, 2 append. A-015-NH OWRR (1).

Descriptors: *Hydrologic budget, *Wetlands, *New England, *Water conservation, *Evaporation control, Methodology, Hexadecanol, Octadecanol, Hydrologic data, Data collections, Evapotranspiration, Water balance, Surface waters, Ponds, Meteorological data, Evaporation pans, Vegetation, Water storage.
Identifiers: *Jewell Pond (N. H.).

Methods of increasing the water yield of wetlands in New England during the dry months of the year were investigated. The water losses, during the months of June, July and August 1969, due to open water evaporation and transpiration by vegetation were equal to about 20 inches of rainfall. The evapotranspiration from the vegetated area was 1.7 times as great as the evaporation from the open-water area. The rainfall during this period was only 8 inches. The wetland stored 12 inches of precipitation and released it slowly during the investigation period. Over 10 inches of the water was released through evapotranspirational losses, and only 2 inches to streamflow. During the second season of the investigation, June 8 through August 30, 1970, an evaporation retardant (hexadecanol and octadecanol) was used to reduce open-water evaporation. This proved to be successful by reducing evaporation approximately 32%, which was equivalent to 9.24 acre-inches or 251,000 gallons. (Woodard-USGS)
W72-09265

AVAILABILITY OF GROUND WATER FOR PUBLIC-WATER SUPPLY IN THE PENSACOLA AREA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 04B.
W72-09267

RURAL WATER SUPPLY IN THE BASEMENT COMPLEX OF WESTERN STATE, NIGERIA,
Ife Univ. (Nigeria). Dept. of Geology.
L. O. Asseez.
Hydrological Sciences Bulletin, Vol 17, No 1, p 97-110, April 1972. 3 fig, 5 tab, 10 ref.

Descriptors: Water resources development, *Groundwater, *Water yield, *Surveys, *Hydrogeology, Stratigraphy, Aquifers, Aquifer characteristics, Springs, Boreholes, Water wells, Specific capacity, Data collections, Hydrologic data.
Identifiers: *Nigeria, *Basement complex.

The Basement Complex is exposed over more than 50% of Western State, Nigeria, and because of the uncertainty of available groundwater resources within it, surface water is the main source of domestic water supply. When dealing with crystalline rocks as potential sources of water supply, a knowledge of the distribution of structural and geomorphic features of such rocks is important in determining well sites. A low success ratio attending previous borehole programs led to a conclusion that the Basement Complex is not a suitable source of groundwater supplies. This conclusion is unfounded, and it is attributed to the practice of locating well sites by intuition. Scientific exploration is the only means of determining potential water zones in crystalline rocks. With the high rainfall and low surface runoff that is typical of the study area, a high rate of recharge into the overburden of the crystalline rocks is expected. Health problems caused by surface pollution can be very significantly minimized by a program of rural water supply using hand-dug wells. Well location should be made by hydrogeologists. (Knapp-USGS)
W72-09275

ANNOTATED BIBLIOGRAPHY OF PUBLICATIONS ON WATERSHED MANAGEMENT BY THE SOUTHEASTERN FOREST EXPERIMENT STATION, 1928-1970,
Forest Service (USDA) , Asheville, N.C. Southeastern Forest Experiment Station.
J. E. Douglass.
USDA Forest Service Research Paper SE-93, March 1972. 47 p.

Descriptors: *Bibliographies, *Watershed management, *Water yield, *Water sources, *Hydrologic cycle, Runoff, *Return flow, *Water quality.
Identifiers: Coweeta Hydrologic Laboratory.

This bibliography contains a brief history of watershed management research in the Southeast and annotated citations to 209 publications by the Southeastern Forest Experiment Station on Watershed Management from 1928 to 1970. Citations are indexed by subject category. (Forest Service)
W72-09603

CHAPARRAL TREATMENT EFFECTS ON STREAMFLOW,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
A. R. Hibbert, and P. A. Ingebo.
In: 15th Annual Arizona Watershed Symposium Proceedings, Arizona Water Commission, Phoenix. p 25-34, September 22, 1971. 7 fig, 2 tab, 6 ref.

Descriptors: *Water yield improvement, *Riparian water loss, *Vegetation effects, *Water loss, *Chaparral, *Evapotranspiration, *Chemcontrol, Brush control, Herbicides, Water conservation, Natural use, Watershed management, Streamflow, Runoff, Seasonal, *Arizona.
Identifiers: *Research watersheds, *Experimental watersheds, Fenuron.

Cover type conversions on several small chaparral watersheds in Arizona have produced substantial increases in water yield on favorable sites. Yield increases have averaged from more than 6 inches per year (five-fold increase in streamflow) on wet sites under dense brush to less than one inch on dry sites under open stands. On the wetter sites, treatment has created perennial flow from the small catchments that consistently were intermittent before conversion. There is some concern that the extra water will subsequently be lost to vegetation along downstream courses. However, because most of the water from treated chaparral is produced in the dormant season when water is already flowing in the channel system, it is believed that 80 percent or more of the extra water will pass through to downstream storage. It is assumed that very little of the winter flow increase, which amounts to about 80 percent of the total increase from treatment, would be lost, but that a substantial part of the 20 percent coming in the summer might be lost to riparian plants. While some watersheds probably will be exceptions, evidence strongly favors an optimistic outlook for retaining yield increases without eliminating downstream riparian vegetation. (Forest Service)
W72-09604

GEOLOGIC AND HYDROLOGIC STUDY OF NORTHERN SARDINIA: REPORT NUMBER 3. THE PROVISION OF WATER FOR THE REGION OF ANGLONA, (IN ITALIAN),
Sassari Univ. (Italy). Faculty of Medical Chirurgy.
For primary bibliographic entry see Field 06D.
W72-09781

3C. Use of Water of Impaired Quality

GROUNDWATER AND DRAINAGE-WATER MINERALIZATION IN THE MUGAN-SA-L'YANY REGION (MINERALIZATSIYA GRUNTOVYKH I DRENAZHNYKH VOD MUGANO--SAL'YANSKOGO MASSIVA),
Azerbaidzhanskii Politekhnicheskii Institut, Baku (USSR).
For primary bibliographic entry see Field 04B.
W72-09750

EFFECTS OF IRRIGATION ON SALT REGIME OF DARK-CHESTNUT TERRACE SOILS IN THE TRANSVOLGA REGION (VLIYANIYE OROSHENIYA NA SOLEVOY REZHIM TERRASOVYKH TEMNO-KASHTANOVYKH POCHV ZAVOLZH'YA),
For primary bibliographic entry see Field 03F.
W72-09751

3D. Conservation in Domestic and Municipal Use

URBAN PUBLIC POLICY AND POLITICAL INSTITUTIONS FOR WATER-QUALITY MANAGEMENT ON LAKE ERIE: YEAR ONE,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 05G.
W72-09787

THE ROLE OF RESEARCH AND DEVELOPMENT IN WATER RESOURCES PLANNING AND MANAGEMENT FOR ACHIEVING URBAN GOALS,
National Planning Association, Washington, D.C. Center for Techno-Economic Studies.
For primary bibliographic entry see Field 06A.
W72-09788

3F. Conservation in Agriculture

LONG-RUN COSTS AND POLICY IMPLICATION OF ADJUSTING TO A DECLINING WATER SUPPLY IN EASTERN WASHINGTON,
Washington, State Univ., Pullman.
For primary bibliographic entry see Field 04B.
W72-09148

OPTIMAL DISTRIBUTION OF WATER TO IRRIGATION CANALS,
McGill Univ., Montreal (Quebec).
M. A. Muspratt.
Journal of Hydrology, Vol 14, No 1, p 19-28, Oct 1971. 3 fig, 10 ref, 2 append.

Descriptors: *Optimization, Distribution systems, Irrigation canals, Stochastic processes, Water, Histograms, Water utilization, Optimum use, Irrigation systems, *Water distribution (Applied), Nonlinear systems, Mathematical studies, Systems analysis, Monte Carlo method, Irrigation efficiency, *Irrigation practices.
Identifiers: *Deterministic model, Canada.

One of the principal problems of the irrigation planner is to determine the most efficient assignment of water to an irrigation canal network. Systems optimization based on mathematical programing is described for water assignment to irrigation canal networks with capacity constraints. Stochastic optimization is achieved by coupling deterministic linear programing with Monte Carlo simulation, including serial and cross correlations. In addition, posterior information may be considered by invoking Bayes' theorem. Nonlinear systems are also described. (USBR)
W72-09195

ESTIMATING SOIL MOISTURE DEPLETION FROM CLIMATE, CROP AND SOIL DATA,
Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
For primary bibliographic entry see Field 02G.
W72-09223

TWO- AND THREE-DIMENSIONAL INFILTRATION: SEEPAGE FROM IRRIGATION CHANNELS AND INFILTROMETER RINGS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
For primary bibliographic entry see Field 04A.
W72-09270

INTRODUCTION OF RISK AND UNCERTAINTY CONCEPTS TO OPTIMIZATION OF WATER RESOURCES SYSTEM DESIGN,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09290

A COMPARISON OF STOCHASTIC LINEAR PROGRAMMING AND SIMULATIONS FOR THE EVALUATION OF HYDROLOGIC ECONOMIC RISKS IN WATER RESOURCES SYSTEM DESIGN,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09293

THE EFFECT OF RISK TAKING BY USERS OF IRRIGATION WATER,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09294

RISK PROGRAMMING: AN AID IN THE PLANNING OF A RESERVOIR - IRRIGATION SYSTEM,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09295

SOIL NITROGEN CYCLE--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02G.
W72-09299

MANSON UNIT, CHELAN DIVISION, CHIEF JOSEPH DAM PROJECT, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boise, Idaho. Region 1.
For primary bibliographic entry see Field 08C.
W72-09473

HITSON, C AND L AND WASHBURN DRAWS, WATERSHED, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENTS).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-09476

WESTERN UNIT FLOOD PROTECTION PROJECT, BILLINGS, MONTANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 04A.
W72-09482

EXTENDING THE UTILITY OF NON-URBAN WATER SUPPLIES,
Utah State Univ. Foundation, Logan.
For primary bibliographic entry see Field 06B.
W72-09525

AGRICULTURAL WATER DEMANDS,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 06D.
W72-09526

CHARACTERISTICS OF STREAMFLOW AT GAGING STATIONS IN SHELL CREEK, ELKHORN RIVER, AND SALT CREEK BASINS, NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 02E.
W72-09556

RESPONSE OF RICE TO PHOSPHATE MANURING IN A WATERLOGGED LATERITIC SANDY LOAM OF KERALA,
Central Rice Research Station, Shoranur (India).
R. R. Nair, and P. N. Pisharody.
Agricultural Research Journal of Kerala. Vol. 8, No. 1, p 6-13. 1970.
Identifiers: India, Kerala, *Loam, *Fertilizers, *Phosphates, *Rice, *Crop response.

The results of 6 field experiments conducted under waterlogged conditions over a period of 35 yr show that response of rice to phosphate manuring was not significant. Neither the form in which the phosphate was applied nor varying the doses of N and potash with which phosphate was applied had any effect in influencing rice yields. The phosphates present in the soil are sufficient for rice.--Copyright 1972, Biological Abstracts, Inc.
W72-09578

CONTAMINATION OF SURFACE AND GROUND WATER WITH PESTICIDES APPLIED TO COTTON,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 05B.
W72-09657

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, SANDOVAL AND LOS ALAMOS COUNTIES,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, J. J. Folks, J. U. Anderson, and W. B. Gallman.
Available from the National Technical Information Service as PB-210 149, $3.00 in paper copy, $0.95 in microfiche. Agricultural Experiment Station Research Report 188, New Mexico State University, Las Cruces, 1971. 45 p, 2 fig, 7 tab, 8 ref. OWRR B-015-NMEX (9).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Sandoval County (NMex), Los Alamos County (NMex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

The suitability of soils in Sandoval and Los Alamos Counties, New Mexico for irrigation is described. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The general soil map and a detailed soil survey provided the information for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and the irrigation land classification map. Sandoval and Los Alamos Counties have about 2,448,000 acres, of which about 29 percent were suitable for irrigation. About 14,652 acres were in irrigation class 1; 193,777 acres in class 2; 190,468 acres in class 3; and 309,916 acres in class 4. The remaining 1,739,187 acres in the counties were in land class 6, which was not considered suitable for irrigation. Information on soil resources is provided that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-09658

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, CHAVES COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, V. G. Link, J. U. Anderson, and M. V. Hodson.
Available from the National Technical Information Service as PB-210 150, $3.00 in paper copy, $0.95 in microfiche. Agricultural Experiment Station Research Report 192, New Mexico State

University, Las Cruces, 1971, 48p, 3 fig, 7 tab, 6 ref. OWRR B-015-NMEX (10).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Chaves County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is provided on the suitability of soils in Chaves County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The general soil map and a few detailed soil surveys provided the information for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and the irrigation land classification map. Chaves County has about 3,900,800 acres, of which about 45 percent were suitable for irrigation. About 388,030 acres were in irrigation class 1; 592,363 acres in class 2; 555, 897 acres in class 3; and 200,724 acres in class 4. The remaining 2,163,786 acres in the county were in land class 6, which was not considered suitable for irrigation. Information on soil resources is provided that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-09659

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, GRANT COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, R. E. Neher, and J. U. Anderson.
Available from the National Technical Information Service as PB-210 151, $3.00 in paper copy, $0.95 in microfiche. Agricultural Experiment Station Research Report 200, New Mexico State University, Las Cruces, 1971, 43 p, 6 fig, 7 tab, 7 ref. OWRR B-015-NMEX (11).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Grant County (New Mexico), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is provided on the suitability of soils in Grant County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The general soil map based on a reconnaissance soil survey provided the information for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and the irrigation land classification map. Grant County has about 2,540,800 acres, of which about 22 percent were considered suitable for irrigation. About 86,827 acres were in irrigation class 1; 147,793 acres in class 2; 248,867 acres in class 3; and 86,108 acres in class 4. The remaining 1,971,205 acres in the county were in land class 6, which was not considered suitable for irrigation. Information on soil resources is provided that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-09660

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, MORA COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, G. W. Anderson, and J. U. Anderson.
Available from National Technical Information Services as PB-210 152, $3.00 in paper copy, $0.95 in microfiche. Agricultural Experiment Station Research Report 205, New Mexico State University, Las Cruces, 1971, 43p, 7 fig, 7 tab, 7 ref. OWRR B-015-NMEX (12).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Mora County (N Mex), *Soil association, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

Information is provided on the suitability of soils in Mora County, New Mexico for irrigation. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The general soil map and a few detailed soil surveys provided the information for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and on the irrigation land classification map. Mora County has a about 1,244,200 acres, of which about 49 percent were considered suitable for irrigation. About 82,738 acres were in irrigation class 1; 263,648 acres in class 2; 76,162 acres in class 3; and 185,969 acres in class 4. The remaining 635,683 acres in the county were in land class 6, which was not considered suitable for irrigation. Information on soil resources is provided that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-09661

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, DE BACA COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, V. G. Link, W. B. Ballman, and J. U. Anderson.
Available from the National Technical Information Service as PB-210 153, $3.00 in paper copy, $0.95 in microfiche. Agricultural Experiment Station Research Report 206, New Mexico State University, Las Cruces, 1971, 44 p, 2 fig, 7 tab, 8 ref. OWRR B-015-NMEX (13).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *De Baca County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Sil description.

The suitability of soils in De Baca County, New Mexico for irrigation is described. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The general soils map which was based on a reconnaissance soil survey, provided the information for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and on the irrigation land classification map. De Baca County has about 1,514,200 acres, of which about 59 percent were considered suitable for irrigation. About 5,375 acres were in irrigation class 1; 297,381 acres in class 2; 411,588 acres in class 3; and 180,160 acres in class 4. The remaining 640,126 acres were in land class 6, which was not considered suitable for irrigation. Information on soil resources is provided that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-09662

LAND CLASSIFICATION FOR IRRIGATION, ROOSEVELT COUNTY,
New Mexico Agricultural Experiment Station, University Park.
J. U. Anderson, H. E. Dregne, and H. J. Maker.
Available from the National Technical Information Service as PB-210 154, $3.00 in paper copy, $0.95 in microfiche. Agricultural Experiment Station Research Report 163, New Mexico State University, Las Cruces, 1970, 12 p, 2 fig, 4 tab, 5 ref. OWRR B-015-NMEX (14).

Descriptors: New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Roosevelt County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

The suitability of soils in Roosevelt County, New Mexico for irrigation is described. The acreage, general location, and relative capability of the soils for such use are given. A detailed soil survey provided the basic soils information as well as information about limitations and recommendations for the best use of each soil. The data on irrigation land classes are presented on the basis of the 11 soil associations of the general soil survey. Approximately 81 percent of the land was classified as suitable for irrigation. Although widely distributed, it frequently occurs in relatively large tracts. The total irrigable acreage is more than 14 times the area that is now irrigated. This information can be used in appraising the value or suitability of large tracts of land for irrigation. The extent, location, and the relative suitability of land for irrigation is presented on a colored land classification for irrigation map. (Creel-New Mexico)
W72-09663

LAND CLASSIFICATION FOR IRRIGATION, TORRANCE COUNTY,
New Mexico Agricultural Experiment Station, University Park.
J. U. Anderson, and H. J. Maker.
Available from the National Technical Information Service as PB-210 155, $3.00 in paper copy, $0.95 in microfiche. Agricultural Experiment Station Research Report 187, New Mexico State University, Las Cruces, 1971, 15 p, 1 fig, 8 tab, 3 ref. OWRR B-015-NMEX (15).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Torrance County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

The suitability of soils in Torrance County, New Mexico for irrigation is described. The acreage, general location, and relative capability of the soils for such use are given. A detailed soil survey of the area provided the basic soils information as well as information about limitations and recommendations for the best use of each soil. The data on irrigation land classes are presented on the basis of the 11 soil associations of the general soil survey. Approximately 55 percent (1,183,930 acres) was classified as suitable for irrigation. Although widely distributed, about two-thirds of it occurs in relatively large tracts. The total irrigable acreage is more than 50 times the area that is now irrigated. This information can be used in appraising the value or suitability of large tracts of land for irrigation. The extent, location, and the relative suitability of land for irrigation is presented on a colored land classification for irrigation map. (Creel-New Mexico)
W72-09664

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, QUAY COUNTY,
New Mexico Agricultural Experiment Station, University Park.
H. J. Maker, V. G. Link, J. U. Anderson, and W. B. Gallman.
Available from NTIS as PB-210 156. Agricultural Experiment Station Research Report 202, New Mexico State University, Las Cruces, 1971, 45 p, 7 fig, 8 tab, 8 ref. OWRR B-015-NMEX (16).

Descriptors: *New Mexico, *Irrigable land, *Soil classification, *Land classification, Soil investigations, Agriculture, Irrigation.
Identifiers: *Quay County (N Mex), *Soil associations, *Irrigation potential, Soil interpretation, Soil characteristics, Soil description.

The suitability of soils in Quay County, New Mexico for irrigation is described. The acreage, general location, and relative capability of the soils for use in irrigated agriculture are given. The general soil map and a detailed soil survey provided the information for the classification for irrigation. The data were organized and presented on the basis of soil associations shown on the general soil map and on the irrigation land classification map. Quay County has about 1,845,100 acres, of which about 70 percent were considered suitable for irrigation. About 251,989 acres were in irrigation class 1; 533,180 acres in class 2; 435,398 acres in class 3; and 76,836 acres in class 4. The remaining 547,697 acres in the county were in land class 6, which was not considered suitable for irrigation. Information on soil resources is provided that can be used for preliminary planning for irrigated agriculture, forestry, range, urban, engineering, recreation, and wildlife uses. A general soil map and a classification of land for irrigation map, both in color, are included. (Creel-New Mexico)
W72-09665

THE FORMATION AND MAINTENANCE OF WATER-MEADOWS IN HAMPSHIRE, ENGLAND,
Nature Conservancy, Abbots Ripton (England).
For primary bibliographic entry see Field 04A.
W72-09707

OXIDATION-REDUCTION CONDITIONS IN IRRIGATED SOILS OF THE TASHKENT OASIS (OB OSOBENNOSTYAKH OKISLITEL'NO--VOSSTANOVITEL'NYKH USLOVIY OROSHAYEMYKH POCHV TASHKENTSKOGO OAZISA),
Ministerstvo Selskogo Khozyaistva Uzbek SSR, Tashkent. Institut Pochvovedeniya.
M. U. Umarov, N. Zukhurov, Zh. Ikramov, and A. Ergashev.
Pochvovedeniye, No 9, p 62-74, September 1971. 1 fig, 6 tab, 18 ref.

Descriptors: *Soil chemistry, *Chemical properties, *Oxidation-reduction potential, *Irrigated land, Irrigation, Irrigation practices, Rates of application, Irrigation water, Water storage, Groundwater, Water table, Moisture content, Iron, Carbon dioxide, Oxygen, Aeration, Porosity, Crop production, Cotton, Sierozems.
Identifiers: *USSR, *Uzbek SSR, *Meadow soils, *Meadow-Bog soils, *Oases, Soil air.

On-site investigations were conducted in 1968-69 to study the agrochemical and agrophysical properties, oxidation-reduction potential, chemical composition and soil air of irrigated Sierozems, Meadow, and Meadow-Bog soils in the Buka Rayon of the Tashkent Oblast (Uzbek SSR). Neglect of the soil, topography, water table, and stage of cotton development in irrigation and land-reclamation practices impaired the physical properties, oxidation-reduction potential, and aeration of soils of some cotton farms and led to accumulation in soils of chemical substances detrimental to cotton development and yield. Redox potential values of 300-400 mv in the root zone of irrigated Meadow-Sierozem, Meadow, and Meadow-Bog soils were conducive to cotton growth. To prevent the water table from rising and development of unfavorable conditions in soil, moisture depth for cotton planted to irrigated hydromorphic soils with groundwaters at a depth of 1-2 m should not exceed 60-70 cm. Irrigation rates for these soils should be reduced to 600-800 cu m/ha and the number of irrigation periods increased accordingly. (Josefson-USGS)
W72-09743

CHANGE IN PROPERTIES OF CHERNOZEMS OF THE DNEPROPETROVSK OBLAST AS A RESULT OF EROSION (IZMENENIYE SVOYSTV CHERNOZEMOV DNEPROPETROVSKOY OBLASTI V REZUL'TATE EROZII),
For primary bibliographic entry see Field 02G.
W72-09744

EFFECTS OF IRRIGATION ON SALT REGIME OF DARK-CHESTNUT TERRACE SOILS IN THE TRANSVOLGA REGION (VLIYANIYE OROSHENIYA NA SOLEVOY REZHIM TERRASOVYKH TEMNO-KASHTANOVYKH POCHV ZAVOLZH'YA),
N. S. Kistanov.
Pochvovedeniye, No 9, p 118-126, September 1971. 1 fig, 4 tab, 13 ref.

Descriptors: *Land reclamation, *Chestnut soils, *Saline soils, *Irrigation effects, Irrigation systems, Sprinkler irrigation, Irrigation canals, Groundwater, Water table, Salinity, Salts, Sulfates, Chlorides, Carbonates, Gypsum, Farms, Terraces (Geologic), Forestry, Seasonal.
Identifiers: *USSR, Transvolga Region, Volga River, Mineralization.

Studies of the effects of sprinkler irrigation on deeply saline Dark-Chestnut terrace soils in the Transvolga Region were based on investigations in 1953-69 at an experimental farm and in 1965-69 at 2 state-owned farms of the Engel'sskaya Irrigation System. The soils of the region have a sulfate and sodium-sulfate type of salinity. Irrigation under canals produces a continuous downward flow, which interacts with soils containing soluble salts and promotes groundwater mineralization. Location of salt horizons at a depth of 7-10 m increases groundwater mineralization to 4-5 g/liter. To control secondary salinization, remedial measures must be undertaken to prevent the water table from rising. (Josefson-USGS)
W72-09751

DAIRYING IN THE DESERT: AGRICULTURAL INNOVATION IN TUNISIA,
R. Harris.
Geographical Review, Vol 61, No 3, p 444-445. 1971.
Identifiers: Agriculture, *Dairy industry, *Desert, Innovation, Tunisia, Land use.

Dairying in the desert of south-central Tunisia has emerged as an unexpected innovation within a traditional agricultural economy that is changing under the impact of Western values. Specifically, it is a response to governmentally instituted agrarian reform and to the market provided by changing food preferences among the urban middle class. It grows out of, and is capable of further integration with, both cereal and tree-crop dry-farming and irrigated market gardening, and it may point the way to the future development of dairying in other arid and semiarid areas of traditional Mediterranean agriculture that are within reach of growing urban markets. But the resistance of the mass of the Sfaxian population to bovine milk products serves as a reminder that however well adapted to prevailing systems of land use management an agricultural innovation may be, its economic viability and general adoption depend ultimately on the widespread cultural acceptance of its products.--Copyright 1972, Biological Abstracts, Inc.
W72-09752

ON THE MINIMAL SOIL TILLAGE IN GROWING MAIZE UNDER IRRIGATION, (IN BULGARIAN),
Higher Inst. of Rural Economics, Sofia (Bulgaria).
P. Atanasov.
Rastnivod Nauki. Vol 8, No 3, p 65-73, 1971. Illus.
Identifiers: Atrazine, Chernozem, Fertilization, Gramoxom, Irrigation, *Maize-M, Soil moisture, *Tillage, *Crop response.

The results from 3 year's field tests showed that high maize yields (800-1000 kg/o.10 ha grain) can be obtained on typical chernozem soils with arable layer, intensive fertilizing, furrow irrigation, maintenance of minimal preirrigation moisture at 70-75% of the field capacity, using the herbicides atrazine and gramoxom for weed control, eliminating deep stubble plowing, presowing tillings and cultivation during vegetation. The various degrees of reducing presowing tillage and cultivation during vegetation produced no essential change in the yields obtained. Elimnation of basal stubble plowing depressed yields by 4-6% on the average. Fertilizing was highly effective but with a given fertilizer treatment no difference in the effect was observed among the various tillage treatments. The high maize yields obtained at reduced schemes of soil tillage led to 9-12 times increase in labor productivity.--Copyright 1972, Biological Abstracts, Inc.
W72-09753

USE OF GROUNDWATER FOR IRRIGATION IN CLAY COUNTY, NEBRASKA, 1970,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 04B.
W72-09756

PERENNIAL GRASS MIXTURES FOR HAY--PASTURE USE OF LOW-PRODUCTIVE AND ERODED LANDS UNDER DRY FARMING CONDITIONS, (IN BULGARIAN),
Agricultural Research Inst., Karnobat (Bulgaria).
S. Ivanov.
Rastnivod Nauki. Vol 8, No 3, p 115-122. 1971. Illus. English summary.
Identifiers: Birdsfoot, Brome, *Bulgaria, Cocksfoot M, Dry, Erosion, Farming, *Grass-M, Grazing, Hay, Lands, Lucerne-D, *Pasture, Perennial, Resistant, Southeast, Trampling, Trefoil-D, *Yield.

A 4-yr test was carried out to establish perennial grass mixtures for hay-pasture use of low-productive and eroded lands under dry farming conditions. It is expedient to find suitable grass mixtures for cultivated pastures and meadows on nonirrigated low-productive and eroded lands for southeast Bulgaria since high and sustained green mass yields are obtained. The following mixtures produced the highest green mass yields: birdsfoot trefoil 60% + cocksfoot 20% + smooth brome grass 20%-3069.4 kg/O.10 ha, lucerne 30% plus birdsfoot trefoil 30% + cocksfoot 40%-3121.7 kg/O.10 ha. Birdsfoot trefoil has the densest sod in a pure stand while the mixture lucerne 30% + birdsfoot trefoil 30% + cocksfoot 40% is most resistant to trampling and close grazing.--Copyright 1972, Biological Abstracts, Inc.
W72-09772

EFFECTS OF WATER DEFICIENCY ON TRANSFER OF ASSIMILATES FROM LEAVES INTO FRUIT ORGANS OF COTTON, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
A. A. Prokof'Ev, Y. I. Pinkasov, and A. M. Egamberdiev.
Fiziol Rast. Vol 18, No 3, p 563-567. 1971. Illus. English summary.
Identifiers: Assimilates, Carbon-14, Cotton D, *Water deficiency, Fruit, Leaves, Organs, Ovary, *Transfer, Transpiration, *Photosynthetic products.

The distribution of photosynthetic products, transferred from leaves of the sympodial branch into fruit organs of cotton, was studied under various conditions of water supply. Water deficiency interfered with the transfer of C14-assimilates into fruit elements localized at the second and third stage of fruiting. Transpiration was slowed down in the fruit organs with a decreased transfer of substances. The transfer of assimilates was not interrupted and transpiration was intensive in the

ovary at the first stage of fruiting even under conditions of water deficiency. The restoration of soil moisture after insufficient water supply increased the transfer of assimilates into the fruit of inner pods and stimulated their transpiration. A direct correlation was established between the rate of the transfer of C14-assimilates into the fruits and their transpiration.--Copyright 1972, Biological Abstracts, Inc.
W72-09776

INFLUENCE OF SOIL WATER MATRIC POTENTIAL AND HYDRAULIC CONDUCTIVITY ON THE GERMINATION OF RAPE (BRASSICA NAPUS L.),
University of the South Pacific, Suva (Fiji). School of Natural Resources.
J. Williams, and C. F. Shaykewich.
J Exp Bot. Vol 22, No 72: p 586-597. 1971. Illus.
Identifiers: *Absorption, Brassica napus D, *Hydraulic conductivity, *Germination, *Matric potential, Osmotic potential, Potential, Rape D, Seed, Soils, Soil-water-plant relationships.

The influence of matric potential and hydraulic conductivity on the water absorption and germination of rape (B. napus) was investigated by comparative studies in 3 seed-soil water systems. In all systems the rate of germination and total germination were substantially retarded with decreasing matric potential. Hydraulic conductivity of the soil system was demonstrated to be a limiting factor in the germination process. The effects of matric potential and hydraulic conductivity on water absorption followed closely those demonstrated for germination. The influence of matric potential was shown to be comparable to that of osmotic potential provided consideration was given to the hydraulic properties of the soil-seed system.--Copyright 1972, Biological Abstracts, Inc.
W72-09780

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

INTERCEPTOR DRAIN RECOVERY OF CANAL SEEPAGE,
Agricultural Research Service, Brawley, Calif.; and Imperial Irrigation District, Calif.; and Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 08A.
W72-09197

STREAM CAPTURE IN KENTUCKY INDICATED BY DISTRIBUTIONAL RECORDS OF FUNDULUS CATENATUS AND ETHEOSTOMA SPECTABILE,
Eastern Kentucky Univ., Richmond. Dept. of Biology.
B. A. Branson, and D. L. Batch.
American Midland Naturalist, Vol 86, No 2, p 496-500. 1971. Map.
Identifiers: *Distributional, Etheostoma spectabile, Fundulus catenatus, *Kentucky, *Streams, Rivers.

Investigation of topography in the headwaters of the drainages of the Salt and Dix rivers demonstrates at least 2 examples of stream piracy between the 2 rivers. Geologic and ichthyologic evidence indicates that the exchange was from the Rolling Fork to the Dix River System.--Copyright 1972, Biological Abstracts, Inc.
W72-09252

STREAM TEMPERATURE PREDICTION UNDER REDUCED FLOW,
Bonneville Power Administration, Portland, Oreg.
W. L. Morse.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 98, No HY6, Paper 8962, p 1031-1047, June 1972. 3 fig, 36 ref, append.

Descriptors: *Water temperature, *Mathematical models, *Energy budget, Statistical models, Thermal pollution, Columbia River, Computer programs, Path of pollutants, Linear programming, Calibrations.
Identifiers: Little Deschutes River (Oregon).

The thermal energy conservation equation in the form of a quasilinear partial differential equation, previously validated on the Columbia River, was calibrated on a 5-mile reach of the Little Deschutes River for a 9-day period (July 29 - August 6, 1969). With 3-hr unit hydrodynamic-meteorologic data, the water temperature prediction capability of this dynamic, deterministic, one-dimensional model is, on the average, accurate within 0.4 deg. F. This accuracy was accomplished under both parametric and nonparametric statistical tests; drought conditions in the form of fractionally reproduced flow caused this mathematical model to respond as expected. (Knapp-USGS)
W72-09259

WATER TABLE DRAWDOWN AROUND AN OPEN DITCH IN ORGANIC SOILS,
North Central Forest Experiment Station, Grand Rapids, Minn. Northern Conifers Lab.
D. H. Boelter.
Journal of Hydrology, Vol 15, No 4, p 329-340, April 1972. 6 fig, 1 tab, 13 ref.

Descriptors: *Drawdown, *Peat, *Organic soils, *Drainage, *Ditches, Water table, Drains, Water levels, Groundwater movement, Land reclamation, Water yield improvement, Hydraulic conductivity, Forest management.

Water-level control is a potential method of improving the amount and distribution of runoff from peatlands as well as their capability to produce timber, agricultural crops, and wildlife. The effectiveness of this practice varies with the hydraulic conductivity of the peat materials through which the water must flow. An open ditch hastened the drainage of water from surface or near surface horizons of fibric (moss) peat on a typical lake-filled organic soil. However, it had little influence on the water table beyond 5 m from the ditch when the water table was in deeper horizons of moderately decomposed (hemic) peat. In an organic soil with less decomposed (fibric) peat throughout several m depth at the surface a similar ditch influenced the water table as far as 50 m from the ditch. (Knapp-USGS)
W72-09268

TWO- AND THREE-DIMENSIONAL INFILTRATION: SEEPAGE FROM IRRIGATION CHANNELS AND INFILTROMETER RINGS,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
E. G. Youngs.
Journal of Hydrology, Vol 15, No 4, p 301-315, April 1972. 17 fig, 2 tab, 16 ref, append.

Descriptors: *Seepage, *Canal seepage, *Laboratory tests, Leakage, Hydraulic models, Water loss, Analog models, Model studies, *Infiltration, Saturated flow, Unsaturated flow.

Steady seepage rates from flat-bottomed channels and channels of semi-circular cross-section were determined in laboratory tank experiments using various sands. Good agreement was found with the theoretical relationships, which assume the flow to be confined to a saturated region bounded by a capillary-fringe surface, and to be uniform and vertical at great depths. The steady large-time seepage rates were also obtained in laboratory sand-tank experiments for the three-dimensional cases of seepage from circular shallow ponds and hemispherical sources. These agreed with relationships obtained using an electrolytic tank analog with approximate boundary conditions assumed for the flow region. A method of analysis of large-time seepage measurements from irrigation channels and infiltrometer rings yields the hydraulic conductivity and pressure head at the wetting front. (Knapp-USGS)
W72-09270

MULTIPURPOSE OPERATION STUDIES OF A CANAL-LAKE-RIVER SYSTEM--OSWEGO RIVER SYSTEM, NEW YORK,
New York State Dept. of Environmental Conservation, Albany. Bureau of Water Resources Planning.
C. S. Liu, D. Muralidhar, and A. C. Tedrow.
Water Resources Bulletin, Vol 8, No 2, p 349-358, April 1972. 7 fig, 4 ref.

Descriptors: *Systems analysis, *Optimization, *Simulation, *Mathematical models, *Planning, *New York, *Flow, *Regulation, *Water resources, *Water quality, *Water supply, Flood control.
Identifiers: *Oswego River Basin System, *Lake regulation rules, Barge Canal.

The Oswego River Basin System in New York State comprises eight major lakes and is regulated by seven individual agencies with somewhat differing primary interests as bases for management. Due to the increasing competitive water demands and usages, it is desirable to seek joint regulation and management of the waters on a basin-wide basis. A planning study is presented which examines the use of systems analysis for setting flow regulation rules for the canal-river system. Proposed are two sets of lake regulation rules: (1) the rule curve for each lake, specifying balanced allocation of the storage in lakes to conservation pools and flood control pools; and (2) the lake-use priority curves for all the lakes, determining lakes' releases depending upon type of operation, time of year, and systems objectives. The operations of a complex water resources system can be represented by the system continuity equation. The problem is solved using simulation and/or optimization, providing simplification and understanding to large-scale water resources systems analysis and facilitating programming and data preparations. (Bell-Cornell)
W72-09287

THE STRUCTURE OF THE SPECIES POPULATIONS IN THE INITIAL STAGES OF SALT--MARSH SUCCESSION,
Foras Taluntais, Wexford (Ireland).
A. J. Brereton.
Journal of Ecology, Vol 59, No 2, p 321-338. 1971. Illus. Maps.
Identifiers: Marshes, Model studies, *Plant populations, Puccinellia maritima M, Salicornia europaea D, Salinity, *Salt, Species, Succession, Saturated soils.

The factors controlling the vegetational development during the initial stages of the salt-marsh succession were examined. Population structure of Salicornia europaea and Puccinellia maritima, the major species present, was described and the factors responsible for this structure were analyzed. A previously suggested model describing the structural changes during succession was examined and extended. The various successional stages were determined by the overall level of waterlogging as controlled by the height of the marsh surface relative to sea level. Within each successional phase the species distribution was controlled by variations in salinity and waterlogging which were associated with local differences in soil texture. Salicornia tended to occur in highly saline non-waterlogged areas whereas Puccinellia tended to occur in non-saline waterlogged areas. In the initial stage of the succession the distribution of both species was random. The initial random distribution was followed by an aggregated distribution. Both the scale and intensity of aggregation increased up to the point where clump coalescence occurred. Following clump

coalescence there was some evidence that both the scale and intensity of aggregation decreased. On the basis of the results presented, Greig-Smith's model describing changes in structure during succession has been extended.--Copyright 1972, Biological Abstracts, Inc.
W72-09288

INTRODUCTION OF RISK AND UNCERTAINTY CONCEPTS TO OPTIMIZATION OF WATER RESOURCES SYSTEM DESIGN,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09290

THE DEVELOPMENT OF A MODEL TO EVALUATE HYDROLOGIC RISK IN A WATER RESOURCE SYSTEM,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09291

THE DEVELOPMENT OF A MODEL TO EVALUATE HYDROLOGIC RISK IN WATER RESOURCES SYSTEM DESIGN,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09292

A COMPARISON OF STOCHASTIC LINEAR PROGRAMMING AND SIMULATIONS FOR THE EVALUATION OF HYDROLOGIC ECONOMIC RISKS IN WATER RESOURCES SYSTEM DESIGN,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09293

THE EFFECT OF RISK TAKING BY USERS OF IRRIGATION WATER,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09294

RISK PROGRAMMING: AN AID IN THE PLANNING OF A RESERVOIR - IRRIGATION SYSTEM,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09295

GREAT LAKES HYDROLOGY BY MONTHS, 1946-1965,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 02H.
W72-09298

THE FOUNTAINS OF ROME,
For primary bibliographic entry see Field 08A.
W72-09380

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 9-11.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09433

LAGOON POND NAVIGATION PROJECT, MARTHA'S VINEYARD, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.

Available from the National Technical Information Service as PB-200 542F, $3.00 in paper copy, $0.95 in microfiche. June 1971. 27 p, 1 map.

Descriptors: *Massachusetts, *Channel improvement, *Navigation, *Environmental effects, Channeling, Dredging, Harbors, Navigable waters, Jetties, Coastal structures, Shore protection, Shoals, Shellfish, Aquatic habitats, Fish, Marine animals, Turbidity, Project benefits, Project purposes, Project planning, Coastal engineering.
Identifiers: *Environmental Impact Statements, *Martha's Vineyard (Mass.).

The proposed project will involve dredging approximately 25,000 cubic yards of bottom material in order to provide boating access between the Atlantic Ocean through Vineyard Haven Harbor and the natural deep water mooring basin in Lagoon Pond. The improved channel will be 2,000 feet long, 100 feet wide, and 8 feet deep. The dredge spoil will be used to extend the length of an existing jetty, by 200 feet, to protect the channel from shoaling. The pond has excellent water quality, and shellfish and marine fish populations are not extensive. Land usage is not intensive. Environmental effects of the proposed project include increased channel circulation which may be of benefit to some biota, interference with pond ecology from temporary turbidity, possible human abuse of the lagoon from increased boating, and trapping of sand and retardance of shoaling. The only adverse effect which cannot be avoided is temporary turbidity during construction. Topography limits alternative measures, since the project is intended only as an aid to navigation. Channel size is optimal. Short term environmental use will occur, but long term productivity will be unaffected. Comments of interested entities are included. (Grant-Florida)
W72-09463

PRICE BRANCH OF LITTLE LA GRUE BAYOU, DE WITT, ARKANSAS--FLOOD CONTROL PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.

Available from the National Technical Information Service as PB-202 898F, $3.00 in paper copy, $0.95 in microfiche. November 12, 1971. 25 p, 1 plate.

Descriptors: *Arkansas, *Channel improvement, *Environmental effects, *Flood protection, Dredging, Flood plains, Flood plain zoning, Floods, Drainage systems, Flood damage, Channel erosion, Sediment control, Project purposes, Project benefits, Hydraulic properties.
Identifiers: *Environmental Impact Statements.

The project involves approximately 17,500 feet of cleanout and minor channel straightening of the Price Branch of Little La Grue Bayou to provide greater flood protection to DeWitt, Arkansas. Spoil will be seeded along the length of the project and along certain reaches within the city. The project area is generally rolling hills with agriculture as the main industry. Fishing and wildlife are of low value in the project area itself. Environmental impacts include better usage of the flood plain; continuous drainage for the city, eliminating stagnant pools of water; and improvement of stream hydraulic capacity. Adverse impacts include the unavoidable loss of trees on the banks of the channel and increased sedimentation during construction. Alternatives include snagging and clearing work which was found to be uneconomical; greater channel enlargement, which would provide greater protection but create greater environmental harm; and inaction, which would cause increased channel sedimentation. Flood planning was also considered. Long-term ability to productively use cleared land will contrast with the loss in natural beauty from clearing. (Grant-Florida)
W72-09468

FARMERS LEVEE AND DRAINAGE DISTRICT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.

Available from the National Technical Information Service as PB-204 964D, $3.00 in paper copy, $0.95 in microfiche. September 30, 1970. 12 p.

Descriptors: *Environmental effects, *Levees, *Flood protection, *Land development, *Drainage engineering, *Illinois, Land use, Floods, Drainage, Drainage effects, Agriculture, Productivity, Economics, Project benefits, Landscaping, Bank stabilization, Erosion, Erosion control, Wildlife conservation, Wildlife habitats, Aquatic habitats.
Identifiers: *Environmental Impact Statements, *Farmers Levee and Drainage District (Ill.).

The project would provide local flood protection through levee improvement, extension, and related work. Presently, floods and inadequate drainage adversely affect the agricultural production of the area. Extension of existing levees is expected to result in little adverse environmental impact. There will be only minimal fish and wildlife impact. The plan will promote better land protection which is expected to increase the standard of living in the area. Landscaping for bank stabilization and erosion control, wildlife protection, and beautification will be included. The plan conforms to guidelines determined by economic efficiency, while recognizing the importance of preserving environmental quality. Since the plan has little adverse environmental effects, a 'no action' alternative was not seriously considered. There will be no conflict between short-term use of the environment and long term productivity. Comments of agencies are included. (Ilkson-Florida)
W72-09477

DYERSBURG, TENNESSEE (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 08D.
W72-09480

LEVEE UNIT NO. L-246, MISSOURI RIVER LEVEE SYSTEM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08D.
W72-09481

WESTERN UNIT FLOOD PROTECTION PROJECT, BILLINGS, MONTANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.

Available from the National Technical Information Service as PB-204 575D, $3.00 in paper copy, $0.95 in microfiche. September 1971. 9 p, 1 plate.

Descriptors: *Montana, *Environmental effects, Flood control, *Diversion structures, *Drainage engineering, Ditches, Floodways, Routing, Diversion, Streamflow, Flow control, Flood flow, Flood protection, Surface runoff, Conveyance structures, Bypasses, Water conveyance, Project planning, Project benefits.
Identifiers: *Environmental Impact Statements, *Billings (Mont).

The proposed project consists of a diversion project along the western edge of Billings, Montana. An unloader ditch will intercept flood flows from various irrigation and drainage ditches and natural drainage areas and conduct these flows around developed areas. The project will provide flood protection against a standard project flood and

furnish average annual benefits of $159,000, with an annual operating cost of $5,000. Unavoidable adverse environmental effects include loss of agricultural production on 66 acres of farmland, temporary increases in stream turbidity, and dust and noise associated with construction. Alternatives to the proposed action include reservoir control, levees, flood plain evacuation and flood proofing, channel improvement, and no development. This draft statement has been sent to interested governmental agencies and citizen groups for review. (Blank-Florida)
W72-09482

HUDSON RIVER CHANNEL, NEW YORK--OPERATION AND MAINTENANCE ACTION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Information Service as PB-205 335D, $3.00 in paper copy, $0.95 in microfiche. November 30, 1971. 6 p, 1 map.

Descriptors: *New York, *Environmental effects, *Hudson River, *Channel improvement, *Dredging, Channels, Navigation, Channel morphology, Depth, Shape, Width, New Jersey, Atlantic Ocean, Maintenance, Oil industry, Turbidity, Water quality, Benthic fauna, Safety factors, Federal project policy, Economic impact, Regional economics, Project planning, Project purposes.
Identifiers: *Environmental Impact Statements, *Hudson River Channel (N.Y.).

The proposed action involves maintenance dredging of the Hudson River Channel between New Jersey and New York City. Work will be performed by hopper dredge with the spoil disposal in the Atlantic. The action will permit continued safe and economic use of the existing Federal Channel by maintaining authorized project dimensions. The improvement will permit efficient delivery of petroleum products and other commodities to continue, thereby yielding economic benefits to a densely populated region. Additionally, maintenance will provide for safer handling of vessels, lessening the possibility of oil and other spills. Unavoidable adverse environmental effects include a temporary increase in turbidity with resulting impact on water quality and slight damage to benthic life through removal of bottom materials. The only alternative is no development. (Blank-Florida)
W72-09483

METHOD AND APPARATUS FOR DESILTING AND/OR DESALTING BODIES OF WATER,
B. Girden.
U. S. Patent No. 3,632,508, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 894, No 1, p 305-306, January 4, 1972.

Descriptors: *Patents, *Desilting, *Desalination, Estuaries, Lagoons, *Dams, Gate control, *Gates, Coastal structures, Fresh water, Sea water, Separation techniques.

Various gates and valves are incorporated in a dam-like structure to control the flow of water between the ocean and the estuary. To desilt the estuary a low-level pipe through the dam is closed by means of a gate during the incoming tide. Opening and closing means the sediment, sand, silt, and/or mud are stirred, brought into suspension and then flushed out into the ocean. To desalt the estuary, the gate used for desilting remains open and a one-way valve is operated. On the outgoing tide, water in the estuary will flow into the sea. However, as the tide comes in, the valve will shut and the estuary will remain at the low-tide level. The estuary will be filled by fresh water. The salt water will settle to the bottom. The salt water can be forced through the one-way valve back into the sea. (Sinha-OEIS)
W72-09504

FLOATING BREAKWATER,
A. J. Coleman.
U. S. Patent No. 3,628,334, 3 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 893, No 3, p 853, December 21, 1971.

Descriptors: *Patents, *Breakwaters, Erosion, *Shore protection, *Beach erosion, Waves, Wave action, Conservation.

A breakwater consisting of a series of hollow floats, normally arranged in two rows, is proposed. Each float is designed as an enlarged ball having internal ballast. It is partially submerged and anchored to the bottom by an elongated flexible chain or cable. The balls intercept the waves, in effect, breaking up the waves before their full development. (Sinha-OEIS)
W72-09511

STREAM CHANNELIZATION: CONFLICT BETWEEN DITCHERS, CONSERVATIONISTS,
For primary bibliographic entry see Field 06E.
W72-09538

WATER SUPPLIES AND THE LAND--THE ELKHORN RIVER BASIN OF NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 07C.
W72-09557

AN ANALYSIS OF FOUR TROPICAL RAIN FOREST SITES IN NEW GUINEA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
For primary bibliographic entry see Field 02I.
W72-09576

CALCULATION OF FRAZIL ICE PRODUCTION,
Thoroddsen and Partners, Reykjavik (Iceland).
For primary bibliographic entry see Field 02C.
W72-09629

ICE CONDITIONS IN THE THJORSA RIVER SYSTEM,
National Energy Authority, Reykjavik (Iceland).
For primary bibliographic entry see Field 02C.
W72-09641

BREAK-UP AND CONTROL OF RIVER ICE,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
For primary bibliographic entry see Field 02C.
W72-09642

REGION 7 LAUNCHES PROGRAM TO REDUCE SUBSURFACE DRAIN COSTS,
Bureau of Reclamation, Denver, Colo.
W. A. Lidster.
Reclamation Era, Vol. 57, No. 4, p 14-20, Nov 1971. 7 fig.

Descriptors: *Subsurface drains, *Polyethylene, Drains, Construction methods, Drain spacing, Average costs, Construction equipment, Field investigations, Construction, Construction practices, Field tests, Drain tiles, Plastic pipes, Cost comparisons, Depth.
Identifiers: *Drainage costs, *Plastic tubing, *Excavators, Trench width, Cost curves, Bureau of Reclamation (Reg 7).

To reduce the cost of subsurface drainage work, the Bureau of Reclamation has undertaken a program to investigate new pipe materials and equipment. The average cost of recent subsurface drains in Region 7 is $32,000 per mi. Phase 1 consisted of installing and evaluating corrugated, perforated, polyethylene drainage tubing. Some advantages of this tubing over concrete or clay drain-tile are: (1) is easy to handle; (2) can be manufactured in long lengths; and (3) requires less manpower for installation. Two test reaches of polyethylene tubing were installed in Nebr by a trencher and pipe laying machine. The installation rate for these reaches was about 4 ft/min, 2 to 3 times faster than for equivalent lengths of concrete or clay pipe. Phase 2 was to locate a machine capable of laying tubing at a faster rate. One machine having this potential is a German-made, Hoes Gigant trencher, used in a field demonstration near Courtland, Kans, to install 2,000 ft of polyethylene tubing. The drains were installed 7.5 ft deep, with gravel envelope, at an average rate of 15 ft/min. This demonstration indicated that by using new pipe materials and high speed trenching machines, drainage costs may be reduced. (USBR)
W72-09697

DRAINAGE FROM LEVEL AND SLOPING LAND,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 08B.
W72-09698

CONCRETE BLOCKS FOR EARTH SLOPE PROTECTION,
M. F. Skladnev, and I. A. Sherenkov.
Hydrotechnical Construction, No. 2, p 182-185, Feb 1971. 10 fig, 1 tab.

Descriptors: *Bank protection, *Erosion control, *Slope protection, *Shore protection, Bank erosion, Breakwaters, Erosion, Wave action, Energy dissipators, Hydrauiic structures, Beach erosion, Revetments, Earth dams, Precast concrete.
Identifiers: *Concrete blocks, Japan, Wave absorbers, Prefabrication, Protective coverings.

Prefabricated concrete blocks of varying shapes and weights are widely used in Japan for: (1) constructing protective layers for absorbing wave energy along breakwaters, (2) protecting earth slopes and foundations from wave action and wind-generated waves, (3) protecting riverbeds and banks from erosion, and (4) building barrages, baffles, and small lowhead dams. Dimensions, shapes, weights, methods of placing, and effectiveness of the various prefabricated blocks are discussed. Basic characteristics of 7 types of blocks are given. (USBR)
W72-09705

THE FORMATION AND MAINTENANCE OF WATER-MEADOWS IN HAMPSHIRE, ENGLAND,
Nature Conservancy, Abbots Ripton (England).
J. Sheail.
Biol Conserv. Vol. 3 No. 2 p101-106. 1971. Illus. Map.
Identifiers: Cattle, Drainage, Formation, Hampshire (England), Irrigation, *Maintenance, Sheep, Vegetation, *Water-meadows.

In Hampshire, water-meadows were formed to promote the drainage and irrigation of alluvial meadows. Earthworks and channels enabled the river water to flow more easily over the meadows, and the vegetation was regularly grazed by sheep and cattle, also cut for hay. Between the 16th and mid-19th centuries, farmers formed a distinctive environment, which they carefully maintained. Since that time, irrigation has been replaced by other forms of land management, but its impact can still be seen by the ecologist in the field today.--Copyright 1972, Biological Abstracts, Inc.
W72-09707

MOISTURE CONTENT OF HUMMOCKY SANDS UNDER PINE PLANTINGS IN THE MIDDLE DON REGION (VLAZHNOST'-BUGRISTYKH PESKOV POD SOSNOVYMI NASAZHDENIYAMI NA SREDNEM DONU),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Agrolesomelioratsii, Moscow (USSR).
For primary bibliographic entry see Field 02G.

W72-09749

FLUSHING STUDIES, VICTORIAL CHANNEL, VICTORIA, TEXAS: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-09761

STATUS REPORT ON THE GASTINEAU CHANNEL MODEL STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W72-09762

4B. Groundwater Management

LONG-RUN COSTS AND POLICY IMPLICATION OF ADJUSTING TO A DECLINING WATER SUPPLY IN EASTERN WASHINGTON,
Washington, State Univ., Pullman.
W. R. Butcher, J. W. Crosby, N. K. Whittlesey, D. L. Bassett, and E. C. Weakly.
Washington Water Research Center Report No. 9, October, 1971. 106 p, 15 fig, 20 tab, 1 ref.

Descriptors: *Groundwater availability, *Aquifer management, *Irrigation wells, *Water supply, Costs, Irrigation, *Washington, *Water costs.
Identifiers: *Ritzville-Odessa (Wash).

The consequences of alternative approaches to management of groundwater are evaluated for the Ritzville-Odessa area of eastern Washington. This area was selected because critical groundwater problems already exist there, and much of the necessary information was readily available. The economic part of the analysis is directed toward the costs and profits deriving from a wide range of pumping conditions and cropping and management practices. The unique economic features of groundwater use from a declining aquifer include (1) the changing costs as pump lifts increase, and (2) the interdependence among users. The study indicates that substantial net return can be realized by irrigation of currently dry-farmed lands in the area. Costs of water at current pumping depths of 200-500 feet are not prohibitively high for intensive cropping with high-value crops. If pumping depths reach 700-1000 feet, irrigation may become unprofitable, depending on crops produced and type of farm. Also, a rapid drawdown would cause obsolescence of well and pump equipment, thus increasing costs. The policy issue centers around control of withdrawals: how much should be permitted, and how should control be instituted. (Settle-Wisconsin)
W72-09148

GEOLOGY AND GROUND-WATER RESOURCES OF NORTHWESTERN NORTH CAROLINA,
North Carolina State Dept. of Water and Air Resources, Raleigh. Div. of Ground Water.
R. R. Peace, Jr., and D. R. Link.
Ground-Water Bulletin No 19, June 1971. 135 p, 29 fig, 10 plate, 16 tab, 25 ref.

Descriptors: *Groundwater, *Water wells, *Water quality, *Water yield, *North Carolina, Water resources, Water chemistry, Geology, Hydrogeology, Basic data collections, Hydrologic data, Chemical analysis, Water analysis, Aquifer characteristics, Water utilization, Water levels, Surface waters.
Identifiers: *Northwestern North Carolina.

The northwestern area of North Carolina, an area of about 2,300 square miles, within the Blue Ridge and Piedmont Crystalline Provinces, includes Alleghany, Ashe, Surry, Wilkes, and Yadkin Counties. The minimum amount of water available in northwestern North Carolina is approximately 867,000,000 gpd; 430,000,000 gpd from groundwater and 437,000,000 gpd from surface water. The water table is highest in March and lowest in October, and the most productive wells in the area are those constructed in a topographic depression in a mica schist rock, whereas the least productive wells are those drilled in hills and ridges in a granitic rock. The mineral constituents are, with a few exceptions, within the limits and recommendations set by the U.S. Public Health Service and industrial requirements. Basic data tables of well or spring inventory and chemical or physical analysis of water are included for each of the five counties. The geology of each county is mapped separately. (Woodard-USGS)
W72-09264

AVAILABILITY OF GROUND WATER FOR PUBLIC-WATER SUPPLY IN THE PENSACOLA AREA, FLORIDA,
Geological Survey, Tallahassee, Fla.
H. Trapp, Jr.
Geological Survey Open-file Report 72002, 1972. 101 p, 7 fig, 3 tab, 12 ref, append.

Descriptors: *Groundwater, *Water wells, *Water yield, *Water quality, *Florida, Aquifers, Aquifer characteristics, Water levels, Groundwater recharge, Water level fluctuations, Hydrogeology, Hydrologic data, Basic data collections, Withdrawal, Pumping, Observation wells.
Identifiers: *Pensacola (Fla).

Information is provided on the quality and quanitity of water available from the sand-and-gravel aquifer, the only fresh-water aquifer in the Pensacola, Fla. area, and delineates those areas favorable for public-supply well sites. The project area is southern Escambia County, from Pensacola to State Road 196 north of Quintette. The sediments making up the sand-and-gravel aquifer are exposed at the surface throughout Escambia County and extend as much as 1,000 feet below the surface. The aquifer consists primarily of quartz sand, ranging in size from very fine (1/16-1/8 mm) to very coarse (1-2 mm), and commonly with disseminated small quartz pebbles. Most wells and test holes in the area penetrate less than 300 feet of the aquifer. Long-term records (more than 30 years) of observation wells show no evidence of an overall decline in water levels in the aquifer that cannot be attributed to variations in precipitation. The highest concentrations of dissolved carbon dioxide in water from the aquifer are localized in the southwestern part of the project area. Available data do not indicate a single source of nitrate pollution. However, concentrations of nitrate have increased over the years. Leakage from sewers may be a source as well as septic tanks and industrial pollutants. (Woodard-USGS)
W72-09267

RURAL WATER SUPPLY IN THE BASEMENT COMPLEX OF WESTERN STATE, NIGERIA,
Ife Univ. (Nigeria). Dept. of Geology.
For primary bibliographic entry see Field 03B.
W72-09275

ANALOG MODELING TO DETERMINE THE FRESH WATER AVAILABILITY ON THE OUTER BANKS OF NORTH CAROLINA,
North Carolina Water Resources Research Inst., Raleigh.
G. J. Kriz.
Available from the National Technical Information Service as PB-209 929, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report 64, UNC-WRRI-72-64, April 1972. 88 p, 20 fig, 14 tab, 32 ref, 2 append. OWRR B-006-NC (4).

Descriptors: *Groundwater availability, *Safe yield, *Water wells, *Analog models, *Water management, Water sources, *North Carolina, Model studies, *Saline water intrusion, Pumping, Drawdown.
Identifiers: *Outer banks (NC), *Hele-Shaw model, Pumping rates.

A Hele-Shaw model was used to represent a cross section of a long oceanic island. The two fluids that simulated fresh water and salt water were obtained by adding a viscosity increasing agent to water. The 'fresh water' was added along the top of the fresh water lens in the model at cyclic time intervals. Fluid was pumped from the fresh water lens through one of three galleries. Two of the galleries were located below mean sea level, and one was located at mean sea level. During a test, pumping from a gallery was initiated at a low rate and was continued at that rate until equilibrium of the interface was obtained. The pumping rate was increased in increments allowing equilibrium to be reached at each increment until the maximum continuous rate was obtained. Pumping stopped when the free surface was pulled to the top of the gallery or when salt water was pumped into the gallery. The locations of the free surface and interface were recorded for each pumping rate. The maximum safe pumping rate was related to the rainfall and island conditions and characteristics. All the data are presented graphically in dimensionless form to make them applicable to a wide variety of conditions as well as in tabular and graphical form with dimensions to facilitate their use. Several examples are also included.
W72-09297

HITSON, C AND L AND WASHBURN DRAWS, WATERSHED, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENTS).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-204 561D, $3.00 in paper copy, $0.95 in microfiche. March 1971. 11 p, 1 map.

Descriptors: *Environmental effects, *Flood protection, *Watersheds (Basins), *Land management, *Texas, Floods, Flood control, Flood damage, Flood plains, Structures, Floodwater, Aquifers, Economics, Agriculture, Arid lands, Sediments, Erosion control, Irrigation, Runoff, Energy, Water table, Desalination, Wildlife habitats, Recreation, Diversion structures, Project benefits, Injection wells.
Identifiers: *Environmental Impact Statements.

This is a watershed project for flood protection which includes land treatment measures supplemented by one floodwater retarding structure, two multiple-purpose structures, and diversions. Injection wells are proposed for the disposal of released floodwater by recharge into an underground aquifer. The area's economy depends on agriculture. Average annual floodwater, sediment, erosion, and indirect damages total $410,066. The project will reduce the following: erosion and runoff, waste of irrigation water, floodwater damage, sediment deposition scour damage, future energy needs for the pumping of ground water by reducing water table decline rate, and energy needs for desalination by reducing the rate of salt increase. The project will provide better big game habitat, ground water recharge, irrigation water, and recreational opportunities. The project's adverse effects will be the changed land use of rangeland and occasional inundation of rangeland. Total dependence on an irrigation-agriculture economy precludes any change of the flood plain to less intensive use. Use of dikes to protect urban areas only or land treatment alone would not provide adequate flood protection. Other alternatives will increase adverse environmental effects or involve larger commitments of land resources. Construction will use rangeland not suitable for irrigation because of soil limitations. (Ilkson-Florida)
W72-09476

OIL SPILL REMOVAL METHOD,
Shell Oil Co., New York. (Assignee).
For primary bibliographic entry see Field 05G.
W72-09510

WATER SUPPLIES AND THE LAND--THE ELKHORN RIVER BASIN OF NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 07C.
W72-09557

GROUND-WATER RESOURCES OF CACHE VALLEY, UTAH AND IDAHO,
Geological Survey, Logan, Utah.
L. J. Bjorklund, and L. J. McGreevy.
Utah Department of Natural Resources, Salt Lake City, Technical Publication No 36, 1971. 72 p, 14 fig, 6 plate, 11 tab, 68 ref, append.

Descriptors: *Groundwater resources, *Hydrogeology, *Water wells, *Utah, *Idaho, Hydrologic budget, Water supply, Water yield, Water quality, Groundwater recharge, Hydrologic data, Basic data collections, Pumping, Withdrawal, Chemical analysis, Water levels, Aquifers, Aquifer characteristics, Precipitation (Atmospheric), Streamflow, Reservoirs.
Identifiers: *Cache Valley (Utah and Idaho).

Cache Valley is a north-trending structural valley of about 660 square miles in northeastern Utah and southeastern Idaho. The Cache Valley drainage basin covers about 1,840 sq mi and is a segment of the Bear River basin. The most productive aquifer system in Cache Valley is in the Smithfield-Hyrum-Wellsville area in Utah. Fan and delta deposits form a complex aquifer system that is at least 1,000 feet thick near Logan. The transmissivity of the aquifer in this area ranges from about 10,000 to 330,000 cubic feet per day per foot. Yields to wells of as much as 500 gallons per minute or more are possible from most of the aquifer system. The concentration of dissolved solids in the water is generally less than 400 milligrams per liter. The most productive aquifer systems in the Idaho part of Cache Valley are in the valley of Weston Creek and in fan deposits along the north and west sides of the valley. Well yields are as much as 2,500 gpm, and the concentration of dissolved solids in the water ranges from about 200 to 1,500 mg. The aquifer near Weston, Idaho has an average transmissivity of about 30,000 cubic feet per day per foot. (Woodard-USGS)
W72-09558

GROUND-WATER LEVELS IN THE LOWER ARKANSAS RIVER VALLEY OF COLORADO, 1968-72.
Geological Survey, Lakewood, Colo.

Colorado Water Conservation Board, Denver, Water Resources Basic-data Release No 25, 1972. 28 p, 1 fig, 1 tab.

Descriptors: *Groundwater, *Water levels, *Water wells, *Basic data collections, *Colorado, Aquifers, Hydrologic data, Seasonal, Spring, Irrigation.
Identifiers: *Arkansas River valley (Colo).

Water levels were measured in about 600 wells during the spring prior to the 1972 irrigation season in the lower Arkansas River valley of Colorado. Measurements made each spring during the 4 preceding years are included in the tables of data to serve as references illustrating declining or rising water levels. Previously unpublished water level measurements in about 300 wells are also included. The lower Arkansas River valley of Colorado extends from Pueblo, Colorado to the Kansas State line, a distance of 150 miles, and occupies 500 square miles in parts of five counties. The valley-fill aquifer which is adjacent to, underlies, and is in hydraulic connection with the Arkansas River yields groundwater which is used as a supplemental supply for irrigation in the Arkansas River valley. The valley fill is as much as 300 feet thick, and consists of gravel, sand, silt, and clay of Pleistocene to Holocene ages. The fill ranges from 1 to 14 miles in width and rests in a broad trough cut into the bedrock. The bedrock consists of the Pierre Shale, the Niobrara Formation, the Carlile Shale, the Greenhorn Limestone, the Graneros Shale, and the Dakota Sandstone, all of Cretaceous age. (Woodard-USGS)
W72-09559

THE ROLE OF THE U.S. GEOLOGICAL SURVEY IN WASTE DISPOSAL MONITORING,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 05B.
W72-09616

INFILL OF NUCLEAR RUBBLE CHIMNEYS BY GROUND WATER,
Teledyne Isotopes, Palo Alto, Calif. Palo Alto Labs.
P. R. Fenske, and R. L. Charnell.
Ground Water, Vol 10, No 3, p 10-17, May-June 1972. 7 fig, 4 ref.

Descriptors: *Unsteady flow, *Dupuit-Forchheimer theory, *Groundwater movement, *Nuclear explosions, *Mathematical models, Porosity, Permeability, Drawdown, Water levels, Hydraulic conductivity, Hydrogeology, Aquifer characteristics.
Identifiers: *Underground nuclear explosions.

A theoretical analysis was made of the groundwater infill rate of a rubble chimney produced by an underground nuclear explosion. This model is based on the analogy of a rubble chimney to a small diameter gravity well. The infill history is approximated by integrating production from a series of steady state infill rates based on Dupuit-Forchheimer assumptions. The model was also used for parameter sensitivity analysis. Changes of the hydraulic conductivity have the greatest effect on infill; the radius of influence is most sensitive to changes in the specific yield. The effect on infill rate of using a rubble porosity that decreases with depth is small, although initial infill is more rapid. The hydrogeology data from two events where infill data are available were used with this model. For both BILBY and GREELEY events, agreement between measured and calculated infill data are good. BILBY data suggest that substantial dewatering of the rubble in the chimney occurred before much groundwater entered the chimney. Comparison of the GREELEY data indicates that dewatering of the rubble is minimal but that porosity of the rubble near the surface was higher than originally anticipated. (Knapp-USGS)
W72-09617

MIGRATION AND LEACHING OF METALS FROM OLD MINE TAILINGS DEPOSITS,
Idaho Univ., Moscow. Coll. of Mines.
For primary bibliographic entry see Field 05B.
W72-09620

FLOAT IMPLOSION IN OBSERVATION WELL IN KENTUCKY,
Geological Survey, Louisville, Ky. Water Resources Div.
D. V. Whitesides.
Ground Water, Vol 10, No 3, p 48-52, May-June 1972. 4 photo.

Descriptors: *Observation wells, *Monitoring, *Equipment, *Damages, *Atmospheric pressure, Kentucky, Storms.
Identifiers: *Floats (Observation well).

On the morning of July 14, 1971, at approximately 6 a.m., Eastern Daylight Time, a severe storm passed through north-central Kentucky. The storm was part of a turbulent weather system that lasted for several days in the central part of the State. Accompanying high winds, tornadoes, and heavy rains caused considerable damage to some buildings in the area. The atmospheric pressure changes caused by this weather system were evidently sufficient to crush the float in an observation well. The 'weep hole' (for pressure equalization) in the top of this float may have been sealed during fabrication. This would not impair the operation of the float in the well under normal conditions, but when an extreme low-pressure condition accompanying the storm changed to high pressure as the storm passed, the float was crushed by the sudden pressure change. (Knapp-USGS)
W72-09621

GROUNDWATER AND DRAINAGE-WATER MINERALIZATION IN THE MUGAN-SA-L'YANY REGION (MINERALIZATSIYA GRUNTOVYKH I DRENAZHNYKH VOD MUGANO--SAL'YANSKOGO MASSIVA),
Azerbaidzhanskii Politekhnicheskii Institut, Baku (USSR).
A. S. Muradov.
Pochvovedeniye, No 9, p 115-117, September 1971. 1 tab, 2 ref.

Descriptors: *Land reclamation, *Salinity, *Salts, *Groundwater, *Drainage water, Drainage systems, Drains, Leaching, Sampling.
Identifiers: *USSR, *Azerbaydzhan, *Mineralization.

Results of observations of soil salinization before installation of a drainage system in the Mugan-Sal-'yany region of Azerbaydzhan in 1954 and during the first years of its operation (1954-62) are presented. The amount of salts removed by drainage water was almost 10 times that previously leached from the top meter layer of soil. Groundwater mineralization was in all cases lower than that of drainage water, while the rate of decline of groundwater mineralization was greater. The more rapid decrease in groundwater mineralization was attributed to the removal of salts by drains from the depths at which they were installed as well as from the deeper layers. (Josefson-USGS)
W72-09750

NUMERICAL METHODS FOR DETERMINING STREAMLINES AND ISOPRESSURES FOR USE IN FLUID-FLOW STUDIES,
San Francisco Energy Research Lab., Calif.
For primary bibliographic entry see Field 02F.
W72-09754

USE OF GROUNDWATER FOR IRRIGATION IN CLAY COUNTY, NEBRASKA, 1970,
Geological Survey, Lincoln, Nebr.
E. K. Steele, Jr.
Nebraska Water Survey Paper No 32, May 1972. 40 p, 13 fig, 5 tab, 12 ref.

Descriptors: *Groundwater, *Irrigation wells, *Water wells, *Nebraska, Withdrawal, Pumping, Water levels, Data collections, Hydrographs, Precipitation (Atmospheric), Groundwater recharge, Irrigation, Water level fluctuations, Water storage, Water balance, Evapotranspiration.
Identifiers: *Clay County (Nebr).

About 126,400 acres, or 35% of the land in Clay County, Nebraska, is irrigated with water pumped from wells. The downward trend of water levels in selected wells since 1958 indicates that the groundwater supply is being depleted progressively in most of the county. Comparison of water levels in the spring of 1970 with estimated water levels prior to irrigation development shows a net decrease of about 519,000 acre-feet in the stored supply. Pumpage (about 208,000 acre-feet) during the 1970 irrigation season reduced groundwater storage an additional 131,000 acre-feet, increasing total depletion of the stored supply to about 650,000 acre-feet since irrigation development began. If seasonal water-level declines are proportional to seasonal pumpage, hydrographs of water-level changes since 1958 in five wells show that the net decline in 1970 was more than in 1967, 1968, or 1969 but not as great as in 1966. (Woodard-USGS)
W72-09756

GROUND-WATER HYDRAULICS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-09769

4C. Effects on Water of Man's Non-Water Activities

HYDROLOGIC INVESTIGATION OF SMALL WATERSHEDS IN OHIO, PHASE I: 1966-1969,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 02A.
W72-09296

WILLARD, KENTUCKY. PARTIAL FLOOD PROTECTION PLAN, DRY FORK OF LITTLE FORK OF LITTLE SANDY RIVER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08D.
W72-09464

EXTENDING THE UTILITY OF NON-URBAN WATER SUPPLIES,
Utah State Univ. Foundation, Logan.
For primary bibliographic entry see Field 06B.
W72-09525

RECONNAISSANCE STUDY OF SEDIMENT TRANSPORTED BY STREAMS, ISLAND OF OAHU,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 02J.
W72-09759

4D. Watershed Protection

THE EFFECT OF CHANNELIZATION ON THE ENVIRONMENT.
Congress, Washington, D.C.; and Committee on Public Works (U. S. Senate).
For primary bibliographic entry see Field 05G.
W72-09459

TALLULAH CREEK WATERSHED (LONG CREEK PORTION), NORTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09475

ECOLOGICAL DYNAMICS OF WATERSHEDS,
Washington Univ., Seattle. Center for Quantitative Science in Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 02A.
W72-09565

ANNOTATED BIBLIOGRAPHY OF PUBLICATIONS ON WATERSHED MANAGEMENT BY THE SOUTHEASTERN FOREST EXPERIMENT STATION, 1928-1970,
Forest Service (USDA) , Asheville, N.C. Southeastern Forest Experiment Station.
For primary bibliographic entry see Field 03B.
W72-09603

PROCEEDINGS - WORKSHOP ON SEDIMENT CONTROL.

Available from the National Technical Information Service as PB-210 147, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute Report No 63, February 10, 1972. J. M. Stewart and J. A. Phillips, editors. 116 p. OWRR A-111-NC (30).

Descriptors: *Sediment control, *North Carolina, *Soil erosion, *Soil conservation, Water pollution control, *Erosion control, Legal aspects, Organizations, Administrative agencies, *Water policy.

This workshop was attended by representatives of various organizations and governmental agencies within North Carolina. Selected groups, representing a broad range of interests, discussed their responsibilities and programs. Major objectives were to clarify the problem and develop guidelines which can be used to strengthen sediment control programs in the State. The first half of the workshop was devoted to presentations by a number of organizations and agencies to review policies, programs, legal aspects, and major areas of concern. In the afternoon session, participants worked in groups to explore specific problem areas and reported their conclusions to those attending. Sponsors were the Agricultural Extension Service, Land Use Congress, Soil Conservation Service, State Soil and Water Conservation Committee of the Department of Natural and Economic Resources, and the Water Resources Research Institute.
W72-09656

RECONNAISSANCE STUDY OF SEDIMENT TRANSPORTED BY STREAMS, ISLAND OF OAHU,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 02J.
W72-09759

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

INFECTIOUS PANCREATIC NECROSIS VIRUS: COMPARATIVE FREQUENCIES OF ISOLATION FROM FECES AND ORGANS OF BROOK TROUT (SALVELINUS FONTINALIS),
Guelph Univ. (Ontario). Dept. of Veterinary Microbiology and Immunology.
C. Frantsi, and M. Savan.
Journal of the Fisheries Research Board of Canada, Vol. 28, No. 7, p 1064-1065, 1971. 1 tab, 4 ref.

Descriptors: *Fish diseases, *Brook trout, *Viruses, Trout, Fish, Bacteria, Fish hatcheries, Fisheries, Fish management, Pollutant identification.
Identifiers: *Stress, Feces, Organs, Infectious pancreatic, *Necrosis virus.

When isolation of infectious pancreatic necrosis (IPN) virus was attempted simultaneously from feces and organs of brook trout, the virus was isolated more frequently from organs than from feces. However, the greater the degree of stress on the fish, the closer the number of isolations from feces appeared to approach that from organs, and the virus was isolated from both organs and feces of each of 10 fish accidentally exposed to low oxygen concentration for 4 days. The findings suggest that masked viral and bacterial infections may be detectable if fish are plaed under stress. (Dorland-Iowa State)
W72-09152

INVERTEBRATES COLLECTED ON AND AROUND CARROLL ISLAND, MARYLAND,
Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05C.
W72-09173

THIN LAYER CHROMATOGRAPHY AND INFRA-RED AND ULTRA-VIOLET SPECTRA OF FENTHION AND SEVEN OF ITS DEGRADATION PRODUCTS,
Drexel Univ., Philadelphia, Pa. Dept. of Chemistry.
Irwin H. Suffet, George Doza, and Samuel D. Faust.
Water Research 5 (7): 473-490. 1971. Illus.

Descriptors: *Chromatography, *Pesticides, Pollutant identification, *Degradation (Decomposition), Infrared radiation, Ultraviolet radiation, Path of pollutants.
Identifiers: *Thin layer chromatography, *Ultraviolet spectra, *Infrared spectra.

Aqueous environmental contamination by fenthion has been reported. The disappearance of fenthion has been shown, but the environmental fate of its metabolites has not been considered. A simple and versatile thin layer chromatographic procedure for screening fenthion and its metabolites is presented. Confirmation of identity of the parent and its metabolites separated by chromatography is essential for the analysis of aqueous residues in order to delineate environmental fate. IR spectra augmented by UV spectra for fenthion and 7 of its metabolites is capable of elucidating the confirmatory identification. The characteristic IR absorption frequencies are tabulated. The regions of characteristic absorption for P=S, P=O, S-O, and O-S-O are discussed. The UV spectra of fenthion, its sulfoxides, sulfones, and hydrolysis product have distinctively different UV wavelength maxima. Whereas microgram amounts of material are necessary for micro-IR analysis, nanogram amounts are needed for micro-UV analysis.--Copyright 1972, Biological Abstracts, Inc.
W72-09182

OPTIMAL SEARCH FOR POLLUTION SOURCES,
California Univ., Berkeley. Human Factors in Technology Research Group.
For primary bibliographic entry see Field 05B.
W72-09232

TAXONOMY OF MARINE BACTERIA: BENECKEA NIGRAPULCHRITUDA SP. N.,
Hawaii Univ., Honolulu. Dept. of Microbiology.
P. Baumann, L. Baumann, M. Mandel, and R. D. Allen.
Journal of Bacteriology, Vol. 108, No. 3, p 1380-1383, December 1971. 7 fig, 2 tab, 5 ref.

Descriptors: *Marine bacteria, *Biological properties, Systematics, Metabolism, Amino acids, Organic acids, Sugars, Carbohydrates, Isolation, Analytical techniques, Cultures.
Identifiers: *Beneckea nigrapulchrituda, *Substrate utilization, Enrichment, Media, Agars, Monosaccharides, Polysaccharides, Culture media, Beneckea parahaemolytica, Beneckea campbellii, Beneckea neptuna, Beneckea nereida, Beneckea alginolytica, Beneckea pelagia, Beneckea natriegens.

Fourteen bacterial strains of marine origin, which formed colonies containing crystals of a blue-black pigment, were submitted to a morphological, physiological, and nutritional characterization and found to exhibit those traits characteristic of the genus Beneckea. Since the production of a dark, blue-black pigment was the sole trait which distinguished those strains from the genus, an emendation of the genus Beneckea to include this feature has been proposed. A new species designation is based on the fact that the 14 phenotypically similar strains differed in many unrelated, phenotypic traits from the other species composing the genus. (Holoman-Battelle)
W72-09241

PERFORMANCE AND APPLICATION OF A NEW REFERENCE ELECTRODE FOR

PROCESS POTENTIOMETRIC MEASUREMENTS,
Beckman Instruments, Inc., Fullerton, Calif.
R. M. Neti, and R. H. Jones.
ISA Transactions, Vol. 10, No. 1, p 90-100, 1971. 8 fig.

Descriptors: *Chemical analysis, Analytical techniques, *Laboratory equipment, Monitoring, Water analysis, Hydrogen ion concentration.
Identifiers: *Ion selective electrodes, High purity water, Reference electrodes.

A new reference electrode, constructed of a plastic body which serves as a non-flowing junction and which contains the electrolyte (conventional silver-silver chloride half-cells in contact with a saturated potassium chloride electrolyte) has been developed for process potentiometric measurements. The electrode operates without counter-pressurization of the internal electrolyte. Performance data with respect to reference potential includes: stability in various solutions and high purity water; effects of pressure, temperature, and flow; and electrode life. The electrode was found to be unsatisfactory in a fermenter application where it had to undergo steam sterilization. Difficulties have also arisen from electrode coating in a few applications. In most instances, however, the new electrode has performed better and outlived hundreds of glass bodied electrodes. Information is presented on installation, operation, and maintenance of the new electrode, and it is evaluated in a variety of process applications. (Mackan-Battelle)
W72-09242

DETERMINATION OF COPPER, IRON, AND ZINC FROM A SINGLE SMALL SAMPLE,
Wayne State Univ., Detroit, Mich. Dept. of Biochemistry; and Wayne State Univ., Detroit, Mich. Dept. of Pathology; and Wayne State Univ., Detroit, Mich. Dept. of Microbiology.
R. Watkins, M. Weiner, and B. Zak.
Microchemical Journal, Vol. 16, No. 1, p 14-23, March 1971. 5 fig, 1 tab, 16 ref.

Descriptors: *Separation techniques, *Heavy metals, *Copper, *Iron, *Zinc, Analytical techniques, Trace elements, Spectrophotometry, Aqueous solutions, Methodology, Absorption.
Identifiers: *Biological samples, Chemical interference, Serum, Precision, Absorbance, Sample preparation, Chemical recovery.

In biological samples such as serum, copper and iron can be determined sequentially in one aliquot of a trichloroacetic acid-ascorbic acid filtrate followed by the determination of zinc in a second aliquot. In the sequential procedure, bathocuproine sulfonate (BCS) is added to the filtrate and the absorbances are read at both 484 and 534 nm in order to obtain readings for copper and the iron blank. With the addition of bathophenanthroline sulfonate (BPS) to the iron blank and sample, the sample is read again against the blank at 534 nm. The difference between absorbances for the original iron blank and the BPS-filtrate sample is proportional to the iron concentration. Alternatively, copper, iron, and zinc can either be determined individually in three aliquots of the same solution or separately in a smaller sample. The Zincon reagent is used for zinc determinations, BCS for copper, and BPS for iron. All of the reactions involved are selective for the three metals and the quantity of metal recovered from the samples is based on absorption spectra obtained spectrophotometrically. The various parameters of the procedure are optimum for color formation and without interference or interaction for any metal by either of the other two metals. Comparative data show these procedures to be extremely precise and accurate. (Holoman-Battelle)
W72-09243

ELECTRO-OXIDATION OF IODINE ON SMOOTH PLATINUM IN AQUEOUS MEDIA,
Pisa Univ. (Italy). Istituto di Chimica Analitica ed Elettrochimica.
G. Raspi, F. Pergola, and R. Guidelli.
Analytical Chemistry, Vol. 44, No. 3, p 472-479, March 1972. 9 fig, 15 ref.

Descriptors: *Iodine, *Oxidation, *Electrochemistry, Ions, Electrodes, Oxidation-reduction potential, Chlorides, Bromides, Halogens, Chemical reactions.
Identifiers: *Electro-oxidation, Oxidation waves, Ion selective electrodes, Platinum.

A voltammetric investigation of the electrooxidation of the iodide ion to species with oxidation numbers higher than O at a platinum microelectrode, with periodical renewal of the diffusion layer (DLPRE), has been carried out both in the presence and absence of chlorides or bromides. For pH values ranging from 1.8 to 7, the voltammogram of iodide ion in the absence of bromides and chlorides, as recorded toward more positive potentials, shows three successive steps due to the electrode processes, iodide ion to molecular iodine, I2 to IOH, and IOH to iodate ion, respectively. The appearance of a current peak between the last two steps is explained by the formation of a surface film of platinum oxides, which hinders the electro-oxidation to iodate ion. In the presence of bromides or chlorides, the voltammogram of iodide ion recorded toward more positive potentials shows three steps, due to the electrode processes iodide ion to molecular iodine, I2 to IX (X equals Cl, Br), and IX to iodic, respectively. The mean limiting current of the IX to iodic step tends to decrease rapidly with time, owing to the partial coverage of the electrode by oxidation products. The use of a pulse-polarographic technique applicable to solid electrodes has permitted the elimination of this inconvenience. (Mackan-Battelle)
W72-09245

CYANIDE EXTRACTION AND ELECTRODISPOSITION OF TRACE AMOUNTS OF RADIOACTIVE SILVER FROM LARGE BIOLOGICAL SAMPLES,
Scripps Institution of Oceanography, La Jolla, Calif.
V. F. Hodge, and T. R. Folsom.
Analytical Chemistry, Vol. 44, No. 2, p 381-383, February 1972. 1 fig, 2 tab, 6 ref.

Descriptors: *Pollutant identification, *Separation techniques, *Radioisotopes, Nuclear wastes, Analytical techniques, Pollution sources, Spectrometers, Radioactivity, Fish, Electrochemistry, Chemical analysis, Inorganic compounds, Zinc radioisotopes, Cobalt radioisotopes, Ions, Chelation.
Identifiers: *Biological samples, *Chemical interference, *Silver radioisotopes, Electrodeposition, Albacore tuna, Tuna, Cyanide, Gamma ray spectrometer, Liver, Sample preparation, Chelating agents, Precision.

Silver-108m and Ag-110m were measured in the livers of albacore tuna without chemical pretreatment and interference by Co-60 and Zn-65. The cyanide ion was utilized as a complexing agent to insure the concentration of trace amounts of radiosilver from kilogram quantities of wet tissue. The experimental procedure consisted of: (1) extracting radiosilver from a prepared slurry with a cyanide solution; (2) electroplating the radiosilver at 0.5 mA/sq cm; (3) stripping the plated Ag with concentrated HNO3; and (4) precipitating the Ag with a NaCl solution. Samples of the precipitated AgCl were counted for 1000-4000 minutes in a 4 pi-2D sodium iodide gamma ray spectrometer and the absolute activities determined by comparison with previously calibrated point sources of Ag-108m and Ag-110m. Charred samples of the sea hare, Aplysia californica, that contained Ag-110m, Co-58 and Co-60 were used to test the efficiency of the procedure. Recovery of Ag-110m was quantitative, within counting errors. Tests of the efficiency of the cyanide leaching process resulted in the quantitative removal of radiosilver. This procedure has been found to be equally effective with slurries of fresh liver, liver preserved in formalin, and biological samples reduced at 250 C to a black char. Since these nuclide ratios can be measured the source of radiosilver in the biosphere can possibly be identified. (Mackan-Battelle)
W72-09246

BURNER MEMORY FOLLOWING ATOMIC ABSORPTION SPECTROPHOTOMETRIC ANALYSIS OF MODERATELY VOLATILE ORGANOMETALLIC COMPLEXES,
Union Carbide Corp., South Charleston, W. Va. Chemicals and Plastics.
D. R. Bryant, and A. R. Hodges.
Analytical Chemistry, Vol. 44, No. 2, p 405-407, February 1972. 1 fig, 2 tab, 10 ref.

Descriptors: *Spectrophotometry, Analytical techniques, Laboratory equipment, Organic compounds, Metals, Vapor pressure, Lead, Manganese, Chromium, Iron.
Identifiers: *Organometallic systems, *Burner memory, Signal persistence, Organic solvents, 2-methoxyethanol, Error sources, Ferrocene, Iron pentacarbonyl, Tris- (2 4-pentanedionato), Iron (III), Tetraethyllead, Tetramethyllead, Cyclopentadienyl-manganese tricarbonyl, Tris- (2 4-pentanedionato) Manganese (III), Chromium hexacarbonyl, Tris- (2 4-pentanedionato) Chromium (III), *Atomic absorption spectrophotometry.

When directly analyzing for metals in organic solutions by atomic absorption spectrophotometry, an organic soluble compound of the metal is needed for standardization. Ferrocene chromium hexacarbonyl, or methylcyclopentadienyl manganese tricarbonyl are logical choices due to their availability, stability, and solubility, but their value as standards is diminished due to persistent memory signals. There appears to be a relationship between the vapor pressure of certain organometallic complexes and burner memory. Ten complexes were dissolved in 2-methoxyethanol and aspirated into a Perkin-Elmer Atomic Absorption spectrophotometer until an absorption plateau was achieved. Aspiration was stopped and signal decay was monitored. The chamber was cleared, null points established and the tests continued. It was found that compounds could be separated into 3 qualitative vapor pressure classifications on the basis of signal persistence following analysis of a compound in solution and on the basis of signal observance when pure samples are charged into the mixing chamber. Compounds of low vapor pressure pose no special problems during analysis. Complexes of high vapor pressure usually show no burner memory after sample aspiration but a signal when the pure complex is charged into the burner chamber. Complexes of moderate vapor pressure can provide a detectable quantity of metal complex but are not easily cleared from the chamber in the normal time between tests. This can contribute to poor precision and apparent zero point fluctuation. Suggestions are made to resolve such problems. (Mackan-Battelle)
W72-09247

ARSENATE IN THE WESTERN NORTH ATLANTIC AND ADJACENT REGIONS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
D. L. Johnson, and M. E. Q. Pilson.
Journal of Marine Research, Vol. 30, No. 1, p 140-149, January 15, 1972. 2 fig, 1 tab, 17 ref.

Descriptors: *Arsenic compounds, *Sea water, *Colorimetry, Atlantic Ocean, Gulf of Mexico, Phosphates, Nutrients, Food chains, Sampling, Vertical distribution, Phytoplankton, Metabolism, Sediments, Pacific Ocean, Water analysis.
Identifiers: *Arsenates, North Atlantic Ocean, Caribbean Sea, Molybdenum blue, Chemical interference, Arsenic.

The concentration of arsenate was measured in 178 samples taken from various depths at 25 stations in the North Atlantic, Caribbean, and Gulf of Mexico using a modified phosphate method of Murphy and Riley (1962) in which colorimetric reagents are mixed with aliquots of the sample and the absorbance due to molybdenum is measured. This absorbance is the sum of the contributions from reduced phospho- and arseno-molybdenum complexes. A reducing reagent is added to additional samples to convert arsenate to arsenite. When the phc :pho-molybdenum complex is again formed, the arsenite does not react and absorbance is due solely to phosphate. The arsenate is determined by the difference between the two sets of readings. Arsenate values were low over the regions examined and vertical distribution of arsenate in the Atlantic was shown to be quite similar to that reported in the Pacific. Both show an increase of about 150 percent between surface and deep water with arsenate comprising 64 to 80 percent of the total inorganic arsenic. Surface-water concentrations of phosphate are sometimes less than those of arsenate which can lead to error in phosphate determinations. Studies of nutrient-phytoplankton relationships in nutrient-depleted waters may have to include some consideration of this problem. (Mortland-Battelle)
W72-09249

THE DETERMINATION OF NITRILOTRIACETIC ACID (NTA) IN SEWAGE AND SEWAGE EFFLUENT,
Water Pollution Research Lab., Stevenage (England).
G. F. Longman, M. J. Stiff, and D. K. Gardiner.
Water Research, Vol. 5, No. 12, p 1171-1175, December 1971. 1 tab, 5 ref.

Descriptors: *Sewage, *Sewage effluents, *Nitrilotriacetic acid, *Analytical techniques, *Methodology, *Evaluation, Chelation, Resins, Metals, Chemical analysis, Pollutant identification.
Identifiers: Chemical interference, Precision, Metal complexes, Chelex-100 resin, Chelating agents, Method evaluation, Sample preparation.

An examination of the accuracy of the various published methods for the determination of NTA revealed that: (1) many of the methods did not eliminate the interference of metals even in distilled-water systems; (2) the satisfactory methods for distilled-water systems did not give reliable results for sewage and effluent systems; and (3) certain modifications were necessary to develop a satisfactory method for determining trace quantities of NTA. The polarographic method was not evaluated. Passage of samples through a chelating resin column (Chelex-100 resin) as a pre-treatment to eliminate metal interference was proposed as the modification for the zinc/zincon method, the method judged as most promising because of its sensitivity and simplicity. To evaluate this modified procedure, standard additions of NTA were made to samples of various kinds, settled sewage and sewage effluents, which were analyzed for NTA. There was generally good agreement between the amounts of NTA and the amounts found in the various samples. The presence of iron had no effect upon NTA recovery. (Holoman-Battelle)
W72-09251

THE SPECTROFLUORIMETRIC DETERMINATION OF SULPHIDE,
Sheffield Polytechnic (England). Dept. of Chemistry.
F. Vernon, and P. Whitham.
Analytica Chimica Acta, Vol. 59, No. 1, p 155-156, March 1972. 4 ref.

Descriptors: *Sulfides, Fluorescence, Intensity, *Copper, *Ions, *Chemical analysis, Aqueous solutions, Sodium compounds, Hydrogen ion concentration, Chemical properties, Fluorometry.
Identifiers: *Spectrofluorimetry, Sodium sulfide, Chemical interference, Cyanide, Sodium hydroxide, 2- (ortho-hydroxyphenyl)benzoxazole, Metal complexes, Detection limits.

The fluorescent properties of HPB (2- (ortho-hydroxyphenyl) benzoxazole) and its copper complex have been examined along with the effects of sulfide ions on solutions of the complex and used in developing a method for the determination of sulfide. In this procedure, a previously prepared sulfide solution is added to a Cu (II) solution after which NaOH and HPB are added. An unknown sulfide sample was treated identically. Using an excitation wavelength of 355 nm, the fluorescence emission intensities of the standards and unknown were measured at 439 nm with an Ammco-Bowman spectrofluorimeter employing a xenon arc and off-axis ellipsoid mirror system. For sulfide concentrations of O-100 ng/ml, a linear plot which passes through the origin was obtained as a calibration curve; the detection limit was 1 ng. The optimum pH range was 10.7-12.5 with fluorescence decreasing markedly below pH 10 and disappearing at pH 8. The addition order and method were found to be important to ensure complete interaction of sulfide and copper ions and the generation of fluorescence. Cyanide was found to interfere with HPB-copper interaction; the cyanide reaction is such that, in the absence of sulfide, the method can be used for cyanide determination, giving a linear calibration curve over the concentration range O-200 ng CN/ml. (Mackan-Battelle)
W72-09253

RAPID PHOTOCHEMICAL DETERMINATION OF URANIUM (VI) AT TRACE LEVELS,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Central Research Dept.
W. M. Riggs.
Analytical Chemistry, Vol. 44, No. 2, p 390-391, February 1972. 1 tab, 5 ref.

Descriptors: *Analytical techniques, *Trace elements, Colorimetry, Metals, Spectrophotometry, Chemical reactions, Ions, Chemical analysis, Reduction (Chemical), Iron, Heavy metals, Separation techniques.
Identifiers: *Photoreduction, *Photochemistry, *Uranium (VI), Trace levels, Uranium, Uranium (IV), Orthophenanthrolene, Precision, Detection limits, Absorbance, Chemical interference, Uranyl.

Uranium can be determined at trace levels using photochemical reactions. Photoreduction with a primary or secondary aliphatic alcohol converts uranium (VI) to uranium (IV). The U (IV) is then treated with excess iron (III) and the reduced iron (II) subsequently produced is determined colorimetrically with orthophenanthrolene solution. The standard deviation of a measurement at the 16.00 micrograms/ml level was 0.81 percent based on four determinations and exemplifies the precision of this method. A calibration curve for uranyl ion concentration can be prepared from the ferrous orthophenanthrolene curve since 1.00 microgram/ml of uranyl ion produces 0.414 micrograms/ml ferrous ion. Sensitivity is good since a concentration of 0.10 microgram/ml of uranyl ion will produce an absorbance value of 0.009, which can be further extended to 0.01 microgram/ml by using 10 cm absorbance cells with the appropriate spectrophotometer. Thus, about 0.02 micrograms can be detected using a 2.0 ml sample, compared to one microgram reported in earlier work. Several ions are known to interfere with photoreduction of the uranyl ion and can be tolerated in varying amounts. Iron will interfere strongly when present in quantities greater than 3 or 4 ppm. This photochemical technique provides a rapid, easy, and sensitive method for analyzing uranium (IV) solutions at concentration below 0.1 ppm. It has further advantages of not being critically dependent on sulfuric acid concentration or on close control of irradiation time, geometry, or intensity. (Mackan-Battelle)
W72-09254

ANALYSIS OF EXPLOSIVES IN SEA WATER,
Naval Ordnance Lab., White Oak, Md.
J. C. Hoffsommer, and J. M. Rosen.
Bulletin of Environmental Contamination and Toxicology, Vol. 7, No. 2/3, p 177-181, February-March 1972. 1 tab, 3 ref.

Descriptors: *Sea water, *Explosives, *Gas chromatography, *Pollutant identification, Pollutants, Analytical techniques, Separation techniques, Water analysis.
Identifiers: *TNT, *RDX, Tetryl, Detection limits, Electron capture gas chromatography.

Benzene-extracted sea water samples from areas in the Atlantic and Pacific Oceans where obsolete munitions have been dumped were analyzed by electron-capture, vapor-phase gas chromatography for the presence of TNT, RDX, and tetryl in the ppb-ppt range. 1,2-dinitrobenzene was used as the internal standard. No peaks corresponding to any of the explosives were observed for either sampling area. The efficiency of the combined extraction and evaporation procedure for the determination of TNT, RDX, or tetryl in sea water at 103, 320, and 1400 ppt, respectively, has been found experimentally to be 70 plus or minus 10 percent and the detection limits were estimated to be 2, 5, and 20 ppt. The present method is being used to measure TNT concentrations in the range of 30 micrograms/ml-0.66 picograms/ml in selected stream waters. (Holoman-Battelle)
W72-09312

DDT RESIDUES IN SALINAS RIVER SEDIMENTS,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 05B.
W72-09313

MICRO SCALE ALKALI TREATMENT FOR USE IN PESTICIDE RESIDUE CONFIRMATION AND SAMPLE CLEANUP,
Food and Drug Administration, Rockville, Md. Div. of Food Chemistry and Technology.
S. J. V. Young, and J. A. Burke.
Bulletin of Environmental Contamination and Toxicology, Vol. 7, No. 2/3, p 160-167, February/March 1972. 1 tab, 8 ref.

Descriptors: *Pesticide residues, *Gas chromatography, *Polychlorinated biphenyls, Alkalis (Bases), *Chlorinated hydrocarbon pesticides, *Separation techniques, Chemical analysis, Pollutant identification, *DDT, Aroclors, Sulfur, Heptachlor, Aldrin, Dieldrin, Endrin, Solvent extractions, Organic pesticides, Chemical degradation.
Identifiers: *Alkali dehydrochlorination, Olefins, Bis (Phenyl) chloroethane, Potassium hydroxide, Electron capture gas chromatography, Saponification, Metabolites, Isomers, o,p'DDT, p,p'DDT, p,p'TDE, o,p'TDE, Methoxychlor, Perthane, Dicofol, 4,4'dichlorobenzophenone, Lindane, Endosulfan I, Endosulfan II, Endosulfan sulfate, Mirex, Heptachlor epoxide, Toxaphene, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1254, Aroclor 1260, Chemical interference, Alpha-BHC, Beta-BHC, Delta-BHC.

The purpose was (1) to arrive at optimum and convenient parameters of the alkali treatment in order to obtain rapid dehydrochlorination resulting in product solutions suitable for analysis by GLC; (2) to obtain complete yield and recovery of olefins from a number of bis (phenyl) chloroethane pesticides; (3) to determine the effect of the treatment on several important pesticide and industrial chemicals; (4) to describe in detail the procedure for routine application in the residue analytical laboratory. Two percent ethanolic KOH with less than 70 percent ethanol and a volume greater than 0.5 ml at steam bath temperature gave complete and rapid dehydrochlorination of p,p'-DDT, o,p'-DDT, p,p'-TDE, o,p'-TDE, methoxychlor, and Perthane and complete recovery of the respective olefins. Interference by fatty substances varied with the pesticide involved. The procedure was ap-

plied to known quantities of the pesticides treated individually in petroleum ether, ethyl ether/petroleum ether Florsil eluates, and petroleum ether containing 30-60 mg of fatty substances extracted from butter. Each pesticide was completely altered in each solution type, and olefin recoveries approximated 100 percent. PCB's of 21-60 percent average chlorine content were stable to the treatment whereas the response of the organochlorinated pesticides varied from complete stability to complete elimination. The most obvious use of alkali treatment is to form olefins of bis (phenyl) chloroethane pesticides for confirmation of residue identity. The GLC retention time region of the reacted compound can be examined for the presence of peaks from unreacted and presumably interfering substances (e.g., PCB's). Alkali treatment also serves to clean up extracts of samples containing non-volatile fatty substances as well as those with non-pesticidal substances which give rise to electron capture response (e.g., sulfur). (Holoman-Battelle)
W72-09314

COLUMN EXTRACTION OF PESTICIDES FROM FISH, FISH FOOD AND MUD,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish Pesticide Research Lab.
R. J. Hesselberg, and J. L. Johnson.
Bulletin of Environmental Contamination and Toxicity, Vol. 7, No. 2/3, p 115-120, February/March 1972. 3 tab, 10 ref.

Descriptors: *Separation techniques, *Gas chromatography, *Chlorinated hydrocarbon pesticides, *Organophosphorus pesticides, *Polychlorinated biphenyls, Pesticides, Fish, Mud, 2 4-D, Dieldrin, Endrin, DDD, DDE, DDT, Aroclors, Organic pesticides, Filtration, Bioassay, Chemical analysis, Analytical techniques, Methodology, Dehydration, Solvent extractions.
Identifiers: Fish food, Column chromatography, p p'DDT, p p' DDE, p p' DDD, Metabolites, Methoxychlor, Parathion, Aroclor 1254, Aroclor 1260, Simazine, Sample preparation, Organic solvents, Carbon-14, Biological samples, Cleanup, Chemical recovery.

Extraction, filtration, and drying can be combined into one step with the new column extraction procedure that has been used for separating pesticides from fish, fish food, and mud samples. The samples were prepared by mixing with anhydrous Na2SO4 until a free flowing dry mixture was obtained. Sample extracts obtained by allowing the extracting solvent to flow into the sample which had been packed into a column were concentrated by evaporation. Hexane saturated with acetonitrile and a Florisil column were used to clean up sample extracts before gas chromatographic analysis. No cleanup was used with the carbon-14-labeled pesticides. A comparative method was investigated in which the fish samples were extracted with diethyl ether in petroleum ether by column extraction and with a Sorvall (R) blender. Gel permeation or the partition-Florsil method was used in extract cleanup. Recoveries of organochlorine insecticides from spiked fish and fish food were 96-100 percent with less than 3 percent variation between successive samples. Parathion recovery from fish samples using 10 percent diethyl ether in petroleum ether was 100 percent. Recoveries for simazine and 2,4-D were 95-99 percent and simazine-spiked mud, 83 percent. With nonspiked fish, column extraction was found to be superior to the blending method in recovering DDT metabolites and PCB's. (Holoman-Battelle)
W72-09315

DETERMINATION OF CARBETAMIDE RESIDUES AND ITS ANILINE METABOLITE,
Rhodia Inc., New Brunswick, N.J. Dept. of Analytical Chemistry.
A. Guardigli, W. Chow, and M. S. Lefar.
Journal of Agricultural and Food Chemistry, Vol. 20, No. 2, p 348-350, March/April 1972. 2 fig, 2 tab, 3 ref.

Descriptors: *Pesticide residues, *Gas chromatography, *Carbamate pesticides, *Pollutant identification, Metabolism, Alfalfa, Wheat, Barley, Separation techniques, Herbicides, Pesticides, Analytical techniques, Chromatography.
Identifiers: *Carbetamide, Metabolites, Ethylamine, Aniline, Amides, 4-bromobenzoyl chloride, Electron capture gas chromatography, Florisil, Cleanup, Detection limits, Column chromatography, Chemical recovery, Chromatograms.

Florisil column chromatography was used to determine carbetamide residues, and at the same time detect the aniline metabolite. Carbetamide is an experimental, selective herbicide used for weed control in cereals, wheat, barley, forages, and alfalfa. The parent compound and its aniline metabolite were separated by liquid-liquid partition of the crop extract. After acid hydrolysis, the carbetamide afforded quantitative yields of ethylamine and aniline which were converted to the corresponding amides with 4-bromobenzoyl chloride. The amides were then separated by column chromatography on Florisil. The limits of detection of these derivatives by electron-capture gas chromatography were generally less than 0.05 ppm and in some cases less than 0.02 ppm. The minimum detector responses obtained for the aniline and ethylamine derivatives of dilute crop substrate samples were, respectively, 0.1 and 0.05 micrograms/ml carbetamide equivalents. The linearity of the range was at least ten times greater than the working concentrations. (Mortland-Battelle)
W72-09316

APPEARANCE OF 1-HYDROXYCHLORDENE IN SOIL, CROPS, AND FISH,
Indiana Univ. Medical Center, Indianapolis. Dept. of Clinical Pathology.
D. P. Bonderman, and E. Slach.
Journal of Agricultural and Food Chemistry, Vol. 20, No. 2, p 328-331, March/April 1972. 5 tab, 14 ref.

Descriptors: Fish, *Chlorinated hydrocarbon pesticides, *Pesticides, *Heptachlor, *Iowa, Soils, Crops, Metabolism, *Gas chromatography, Computer programs, Sunfishes, Catfishes, Carp, Separation techniquex, Regression analysis, Buffalo fish, Bullheads, Halogenated pesticides, Soil analysis, Bioassay, Soybeans, Tomatoes, Corn (Field), Sweet corn.
Identifiers: *1-hydroxychlordene, *Heptachlor epoxide, Metabolites, Thin layer chromatography, Sample preparation, Electron capture gas chromatography, Microcoulometry, Turnips, Biological samples, Chemical recovery, Ictiobus niger, Pomoxis nigromaculatus, Lepomis macrochirus, Ictalurus melas, Cyprinus carpio, Carpiodes cyrinus.

A 4-year study in an area of eastern Iowa revealed the presence of a metabolite of heptachlor, 1-hydroxychlordene, in soil, various crops, and fish. Tissues and fluids obtained from human subjects from this area did not reveal the presence of this metabolite. Soil, crop, and fish samples were analyzed quantitatively and qualitatively using gas chromatography and thin-layer chromatography, respectively. A Fortran IV least squares regression line program was used to compute the concentration of all samples. In addition to the analysis, a survey of randomly selected farmers was conducted to determine pesticide usage for the period 1966-1970. Again, a computer program was used for statistical evaluation of the data. The concentration of 1-hydroxychlordene found in soils in conjunction with heptachlor was consistent with the short half-life reported by Bowman. The appearance of this metabolite in fish was associated with heptachlor and heptachlor epoxide. Transiocation of heptachlor and metabolism in crops account for the appearance of the compound in produce. (Mortland-Battelle)
W72-09317

GROWTH OF OBLIGATE AUTOTROPHIC BACTERIA ON GLUCOSE IN A CONTINUOUS FLOW-THROUGH APPARATUS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Bacteriology.
For primary bibliographic entry see Field 05C.
W72-09318

COMPARISON OF METHODS OF ESTIMATING THE NUMBER OF ESCHERICHIA COLI IN EDIBLE MUSSELS AND THE RELATIONSHIP BETWEEN THE PRESENCE OF SALMONELLAE AND E. COLI,
Public Health Lab., Conway (Wales).
K. L. Thomas, and A. M. Jones.
Journal of Applied Bacteriology, Vol. 34, No. 4, p 717-725, December 1971. 4 tab, 10 ref.

Descriptors: *E. coli, *Salmonella, *Mussels, Enteric bacteria, Aerobic bacteria, Isolation, Mollusks, Coliforms, Bacteriophage, Estimating, Invertebrates.
Identifiers: Mytilus edulis, Salmonella panama, Salmonella virchow, Salmonella paratyphi B, Salmonella brandenberg, Salmonella duisberg, Salmonella eppendorf, Salmonella paratyphi B phage type I, Biological samples, Sample preparation, Macroinvertebrates.

The modified Clegg and Sherwood, Fishmongers' Company Percentage Clean (PC), Clegg and Sherwood single pour plate, and the Clegg and Sherwood four pour plate methods were investigated to determine which would be most simple and rapid to perform and simultaneously give an accurate picture of the extent of bacterial pollution of shellfish. Using the four methods, cleaned and uncleaned mussels were examined for the presence of E. coli and to determine the frequency with which organisms of the Salmonella group could be isolated from those specimens native to and imported into the area studied. Of four methods the semiquantitative methods of the Fishmongers' Company was the most useful from the public health aspect where facilities may be limited. A modification of Clegg and Sherwood's methods, using pour plate, was more sensitive and simpler to perform than the original method and is to be recommended for routine use. Two Escherichia coli cells/ml of mussel tissue probably represents the upper acceptable limit for satisfactory grading of mussels. The presence of small numbers of salmonellaein purified cleaned mussels is probably not highly significant, but tests for their presence will yield useful epidemiological data. (Holoman-Battelle)
W72-09319

HYDROLYSIS AND SOLVENT PARTITION OF PHOSDRIN AND RELATED ORGANOPHOSPHATES,
California Univ., Davis. Dept. of Environmental Toxicology.
For primary bibliographic entry see Field 05B.
W72-09321

IODINE COLORIMETER.
Beckman Instruments, Inc., Fullerton, Calif. Advanced Technology Operations.

Available from the National Technical Information Service as N71-35264, $3.00 in paper copy, $0.95 in microfiche. Final Report FR-1090-101, July 1971. 17 p. 7 fig. Contract No. NAS9-11879.

Descriptors: *Colorimetry, *Iodine, *Spectrophotometry, Potable water, Instrumentation, Water analysis, Prototype tests, Pollutant identification, Equipment, Design, Wavelength, Electrical equipment, Integrated circuits, Model studies, Water treatment, Water analysis, Monitoring.

An instrument has been developed which provides rapid, accurate measurements of low concentrations of bacteriostatic iodine in (spacecraft) potable water supplies. By using a direct spec-

trophotometric method, the need for additional reagents or complexing agents is eliminated. A prototype has been tested which allows detection of iodine from 0-10 ppm at the absorption peak of 426 nm and which displays a linear colorimetric relationship between known sample concentrations and meter detection. Advantages are: elimination of reagent-addition methods and handling procedures, (no iodide need be present) and minimal effort is needed by the operator to achieve accurate iodine measurements. (Mackan-Battelle)
W72-09322

SIMPLE DEVICE FOR INTRODUCTION OF MASS CALIBRANT INTO A GAS CHROMATOGRAPH-MASS SPECTROMETER SYSTEM,
Sun Oil Co., Marcus Hook, Pa.
For primary bibliographic entry see Field 02K.
W72-09323

COATED WIRE ION SELECTIVE ELECTRODES,
Arizona Univ., Tucson. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W72-09324

ROLE OF SOLVENT EXTRACTION PARAMETERS IN LIQUID MEMBRANE ION SELECTIVE ELECTRODES,
Arizona Univ., Tucson. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W72-09325

MASS SPECTROMETRIC ISOTOPE RATIO MEASUREMENTS AND PEAK AREA INTEGRATION USING THE PEAK-SWITCHING FEATURE OF THE AEI MS-902,
North Carolina Univ., Chapel Hill. Dept. of Chemistry.
N. M. Frew, and T. L. Isenhour.
Analytical Chemistry, Vol. 44, No. 4, p 659-664, April 1972. 4 fig, 5 tab, 20 ref.

Descriptors: *Analytical techniques, *Computers, *Data processing, Mass spectrometry, Spectrometers, Isotope studies, Kinetics, Radioactive dating, Radioisotopes, Digital computers, Data collections, Metals, Trace elements.
Identifiers: Digital-to-analog converter, Biological samples, Precision.

Accurate measurements of integrated peak areas and isotope ratios can be obtained using a double-focusing, high-resolution mass spectrometer in conjunction with a small digital computer and analog-to-digital converter. The system can be used to determine trace metals in a variety of materials including geological and biological samples. This is done by integration of the ion current produced by evaporation of the volatile metal chelate from the direct insertion probe. Isotope ratios ranging from unity down to approximately 1 to 50 can be measured with precision of better than 1 percent. With the use of a suitable isotope standard to compensate for instrumental discrimination and for day-to-day variations in instrumental parameters, accuracies in the range of 0.5 to 1 percent are easily attainable. (Little-Battelle)
W72-09326

GC/MS/COMPUTERS,
Waterloo Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W72-09327

DETERMINATION OF ANTIMONY IN GEOLOGICAL MATERIALS BY ATOMIC ABSORPTION SPECTROMETRY,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Geologicke Laboratorium.
V. Stresko, and E. Martiny.
Atomic Absorption Newsletter, Vol. 11, No. 1, p 4-6, January-February 1972. 3 fig, 4 tab, 13 ref.

Descriptors: *Heavy metals, Soils, Spectrometers, Methodology, *Soil analysis, *Spectrophotometry, *Mineralogy.
Identifiers: *Antimony, Chemical interference, Precision, Detection limits, *Atomic absorption, Sample preparation, Ores.

The determination of antimony in sulfide minerals and ores, as well as in soils and silicates, by atomic absorption is described. Ten to thirty ml of 10 percent w/v tartaric acid and 10 ml of concentrated HN03 are added to a powdered sample of 0.2-1 g containing 0.01-1 percent Sb. The mixture is stirred and allowed to stand for several hours before heating for 2-3 hours in a water bath. The antimony, present in the form of sulfide or oxide, dissolves quantitatively. The separated sulfur and dissolved residue are filtered and washed in distilled water. If a large residue remains, the filter is charred and dissolved with HF in the presence of HN03. This solution is added to the main portion and transferred to a 50-ml graduated flask for analysis. Different resonance lines were studied for sensitivity, acid effects, and interference effects. The detection limit of antimony at the most sensitive line was 0.3 micrograms/ml in HN03. Only copper was found to interfere; for samples containing more than 1 percent copper, it was necessary to add at least 2500 micrograms/ml copper to reference solutions and samples. The method described is shown to be simple, precise, accurate, and practically free of interference. (Mortland-Battelle)
W72-09328

THE DETERMINATION OF CALCIUM IN THE 0.1 TO 10 NG REGION BY ATOMIC ABSORPTION SPECTROSCOPY WITH THE HEATED GRAPHITE ATOMIZER,
Aarhus Univ., (Denmark). Inst. of Physiology.
S. Christensen.
Atomic Absorption Newsletter, Vol. 11, No. 2, p 51-52, March-April 1972. 3 fig, 1 tab, 5 ref.

Descriptors: *Calcium, *Aqueous solutions, Analytical techniques, Solvents, Water analysis.
Identifiers: *Atomic absorption spectrophotometry, *Heated graphite atomizer, Absorbance, Detection limits, Phosphatidylethanolamine, Organic solvents.

The amount of calcium present in samples of phosphatidylethanolamine dissolved in organic solvent mixtures can be determined by using atomic absorption spectroscopy with a heated graphite atomizer. Standard curves prepared from absorbance data (12.5-0.1 ng Ca range) obtained by using three different standard calcium solutions (Ca in water, Ca in chloroform-methanol, and BDH Ca-2-ethylhexanoate in benzene-chloroform-methanol) have been used in determining the precision of the method. Using two of the standard solutions in triple determinations, no value was found to deviate more than 4 percent from the triple mean value. Three - 2 mg/ml samples of phosphatidylethanolamine solutions introduced into the atomizer with a 2-microliter one constriction pipette gave absorbance values of 0.620, 0.710, and 0.795 (average 0.708). Using the standard curves, the amount of calcium was calculated to be 1.3 micrograms of Ca/mg of phosphatidylethanolamine. (Holoman-Battelle)
W72-09329

DETERMINATION OF ALUMINUM IN WATER,
Geological Survey, Denver, Colo.
M. J. Fishman.
Atomic Absorption Newsletter, Vol. 11, No. 2, p 46-47, March-April 1972. 3 tab, 2 ref.

Descriptors: *Aluminum, *Water analysis, *Spectrophotometry, Metals, Pollutant identification, Chelation, Separation techniques, Magnesium, Analytical techniques, Flame photometry, Trace elements.
Identifiers: *Atomic absorption spectrophotometry, Precision, Detection limits, Chemical interference, Chemical recovery.

The determination of trace amounts of aluminum in samples of fresh water by atomic absorption spectrophotometry involves the following: (1) Chelation of the element with 8-hydroxyquinoline (oxine) at pH 8.0 and extraction with methyl isobutyl ketone (MIBK) and (2) Aspiration of the extract into the nitrous-oxide-acetylene flame of the spectrophotometer. Samples containing between 10 and 300 micrograms of aluminum per liter may be analyzed by this procedure. Except for magnesium, none of the substances commonly occurring in natural water samples interferes with the determination. Magnesium interference can be avoided if the aluminum oxinate is extracted with MIBK immediately after the sample is buffered at 8.0. Natural-water samples with magnesium concentrations of 1.3-240 mg/l and known concentrations of aluminum were analyzed by the proposed procedure with 95-111 percent recovery of aluminum. To test the precision of the method, replicate determinations were made on three samples over a two-week period. The standard deviations, based on 10 determinations at the 10,57, and 190 microgram/l levels, were 1,3, and 7, respectively. (Holoman-Battelle)
W72-09330

THE DETERMINATION OF LEAD AND CADMIUM IN SOILS AND LEAVES BY ATOMIC ABSORPTION SPECTROSCOPY,
Perkin-Elmer Corp., Norwalk, Conn.
H. L. Kahn, F. J. Fernandez, and S. Slavin.
Atomic Absorption Newsletter, Vol. 11, No. 2, p 42-45, March-April 1972. 2 fig, 8 tab, 8 ref.

Descriptors: *Soils, *Lead, *Cadmium, *Leaves, *Analytical techniques, Pollutants, Separation techniques, Bioassay, Metals, Flame photometry.
Identifiers: *Atomic absorption spectrophotometry, Delves Cup system, Detection limits, Atomic absorption spectrophotometers.

Lead and cadmium have been determined in soil samples after both acid and acetate extractions, and in leaves after digestion in nitric acid. For soils acid extraction gave consistently higher results than did acetate. The lead levels in all soils and leaves were sufficiently high that a standard instrument with a conventional burner could be used. The cadmium levels were in some cases, marginal, and it proved desirable to improve sensitivity by employing a Delves microsampling system in conjunction with the burner. Lead in leaves can be determined directly, without prior dissolution, with the Delves system. It was found that the distribution of lead in leaves is not homogeneous. (Holoman-Battelle)
W72-09331

A MODIFIED DELVES CUP ATOMIC ABSORPTION PROCEDURE FOR THE DETERMINATION OF LEAD IN BLOOD,
Oklahoma Univ., Oklahoma City. Dept. of Environmental Health.
R. D. Ediger, and R. L. Coleman.
Atomic Absorption Newsletter, Vol. 11, No. 2, p 33-36, March-April 1972. 2 fig, 3 tab, 10 ref.

Descriptors: *Lead, *Analytical techniques, Instrumentation, Methodology, Spectrophotometry, Oxidation.
Identifiers: *Blood, *Delves cup method, Biological samples, Atomic absorption spectrophotometry, Precision, Accuracy, Flame atomization.

The Delves cup method for the determination of lead in blood has been modified for a simple, rapid analysis of 10-microliter volumes of blood. This method may be used with an atomic absorption spectrophotometer and most commercial spectrophotometers. The Delves cup procedure involves the atomization of lead from a nickel cup into an absorption tube over an air-acetylene flame. A 10-microliter aliquot of blood is dried in the nickel cup on a hot plate, partially oxidized with hydrogen peroxide, and dried again. The cup is placed on a platinum loop and inserted into the

flame for atomization. The resulting multipeaked absorption signal consists of a separate lead peak and several smoke peaks due to burning organics. When the described procedure was compared with anodic stripping voltammetry and conventional atomic absorption procedures, it was found to give equally accurate results and to be at least as precise as the standard Delves cup procedure. (Holoman-Battelle)
W72-09332

THE ROLE OF THE DIFFUSE LAYER IN WATER-IN-OIL MICROEMULSIONS,
University of Southern California, Los Angeles. Dept. of Chemistry.
S. Levine, and K. Robinson.
Journal of Physical Chemistry, Vol. 76, No. 6, p 876-886, March 16, 1972. 5 fig, 2 tab, 22 ref.

Descriptors: *Emulsions, *Mathematical models, *Dispersion, *Oily water, Mathematical studies, Equations, Electrolytes, Surface tension, Drops (Fluids), Surfactants, Water properties, Ions, Electrical properties, Osmotic pressure, *Salts, Films, Oil-water interfaces.
Identifiers: *Microemulsions, Micelles, Donnan equilibrium.

A modification of Adamson's mathematical model for water-in-oil microemulsions takes into account the diffuse layer in the aqueous droplet interior. A relation governing the equilibrium of the droplet is derived for a 1-1 electrolyte which is based on a balance between the surface tension of the film at the boundary in its uncharged state, the osmotic pressure due to the ionic concentrations, and the Maxwell electrostatic stress associated with the electric field in the internal diffuse layer. By substituting approximate solutions of the Poisson-Boltzman potential distribution equation into the droplet equilibrium condition, estimates which are dependent upon the surface potential can be obtained for the surface tension of the film at the droplet boundary. The determination of the surface tension is a sensitive measure of the accuracy of the various approximate solutions. For surface potentials approximately 50 mV the different values were in broad agreement; however at higher potentials (approximately 100 mV) only one gave plausible results when compared with the computational values. Calculations of the ratios of salt concentration in the droplet to that in the bulk aqueous phase for various droplet radii correspond to available experimental results. (Mackan-Battelle)
W72-09335

VARIATIONS OF SULFUR ISOTOPE RATIOS IN SAMPLES OF WATER AND AIR NEAR CHICAGO,
Argonne National Lab., Ill. Chemistry Div.
For primary bibliographic entry see Field 05B.
W72-09336

FALLOUT CESIUM-137 IN CLAMS (RANGIA CUNEATA) FROM THE NEUSE RIVER ESTUARY, NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Center for Estuarine and Menhaden Research.
D. A. Wolfe.
Limnology and Oceanography, Vol. 16, No. 5, p 797-805, September 1971. 5 fig, 2 tab, 24 ref.

Descriptors: *Clams, *Fallout, *Cesium, *Estuaries, *Salinity, Toxicity, Data analysis, Ion transport, Sediments, Analytical techniques, Ion exchange, Path of pollutants, Water analysis, Radioisotopes, *North Carolina, Mollusks.
Identifiers: Rangia cuneata, Trent River, *Neuse River, Biological magnification, Cesium radioisotopes, Macroinvertebrates, Sample preparation, Biological samples.

The concentration of radioactive cesium in the soft tissues of Rangia cuneata collected from the Trent-Neuse estuary during 1965-1967 was determined and correlated with data previously acquired. The clams were collected by raking; water temperature and salinity were determined simultaneously. The shells, soft tissues, and fluids were dried, ashed at 450 C, and analyzed on an NaI (T1) scintillation crystal. Surface water samples were strained through plankton netting, and analyzed for gamma radioactivity. The mean concentration of radioactive cesium in Rangia was 3.2 plus or minus 1.8 p Ci per 100 gram wet weight. The concentration varied inversely as a logarithmic function of salinity in the estuary. An increasing concentration gradient of radioactive cesium with increasing salinity was confined by the analysis of cesium in estuarine water. It is proposed that the concentration gradient of radioactive cesium in the estuary is a result of the transport of cesium on sediments into estuaries, coupled with ion-exchange displacement of cesium from the sediments at elevated salinities. (Synder-Battelle)
W72-09337

MUTAGENIC EFFECT OF TCDD ON BACTERIA SYSTEMS,
Stockholm Univ. (Sweden). Institutionen for Biokemi.
For primary bibliographic entry see Field 05C.
W72-09338

CONTINUOUSLY SYNCHRONISED GROWTH,
National Research Council of Canada, Saskatoon (Saskatchewan). Prairie Regional Lab.
For primary bibliographic entry see Field 05C.
W72-09340

INTRODUCTORY LECTURE: PROSPECTS AND PROBLEMS IN CONTINUOUS FLOW CULTURE OF MICRO-ORGANISMS,
Queen Elizabeth Coll., London (England). Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W72-09341

SIMPLE DEVICE FOR TRANSFERRING AND ELUTING THIN-LAYER CHROMATOGRAPHIC FRACTIONS,
Wisconsin Univ., Madison. McArdle Memorial Lab.
For primary bibliographic entry see Field 02K.
W72-09342

DETERMINATION OF NANOMOLAR QUANTITIES OF FREE AMINO ACIDS DISSOLVED IN NORTH ATLANTIC OCEAN WATERS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
R. Pocklington.
Analytical Biochemistry, Vol 45, No 2, p 403-421, February 1972. 2 fig, 7 tab, 29 ref.

Descriptors: *Amino acids, *Sea water, *Analytical techniques, *Gas chromatography, *Separation techniques, Atlantic Ocean, Cation exchange, Urine, Aqueous solutions, Sampling, Desalination, Organic acids, Methodology, Water analysis.
Identifiers: *Deionization, *Trimethylsilylation, Lyophilized seawater, Trimethylsilyl derivatives, Plasma, Sample preparation, Sample preservation, Acidification, Detection limits, Precision, Alanine, Glycine, Valine, Leucine, Proline, Serine, Threonine, Aspartic acid, Methionine, Glutamic acid, Phenylalanine, Lysine, Tyrosine, Isoleucine, Hydroxyproline, Biological samples.

An improved gas-chromatographic method for determining amino acids in seawater provides complete separation of small samples quickly and quantitatively. A one-step reaction, trimethylsilylation, is combined with extraction from lyophilized seawater (less than 25 C, 50 millimicrons Hg) and deionization on a cation-exchange column, to prepare volatile derivatives. These are separated on new silicone stationary phases by gas chromatography. Conditions for the detection of as little as 0.01 nanomoles of all the protein amino acids (except arginine and histidine) plus many non-protein amino acids were found. The precision and accuracy of the method were evaluated using standard solutions of amino acids. Duplicate injections agreed with a mean coefficient of variation of 1.5 percent. Samples taken from depths to 5400 meters in the North Atlantic were analyzed, and individual amino acid concentrations were nonuniform and showed statistically significant variations with depth. The method described could probably be applied to determination of amino acids in plasma and urine. (Mortland-Battelle)
W72-09343

THE RELATIVE IMPORTANCE OF FRESHWATER INPUT, TEMPERATURE AND TIDAL RANGE IN DETERMINING LEVELS OF DISSOLVED OXYGEN IN A POLLUTED ESTUARY,
Clyde River Purification Board, East Kilbride (Scotland).
For primary bibliographic entry see Field 05B.
W72-09345

SELECTIVE HYDROGENATION OF SOYBEAN OIL. VI. COPPER-ON-SILICA GEL CATALYSTS,
Northern Regional Research Lab., Peoria, Ill.
S. Koritala.
Journal of the American Oil Chemists' Society, Vol 49, No 1, p 83-84, January 1972. 1 tab, 4 ref.

Descriptors: *Catalysts, *Hydrogenation, *Selectivity, Copper, Copper sulfate, Chemical analysis, Oil, Copper compounds, Reduction (Chemical), Catalysts.
Identifiers: *Soybean oil, *Copper-on-silica gel, Linolenate, Copper nitrate, Copper-chromite.

Copper-on-silica gel catalysts containing 15-20 percent copper prepared from copper nitrate or copper sulfate were evaluated for the selective hydrogenation of soybean oil after calcination at 350 C for 2 hours. The higher copper catalysts were somewhat less selective for the reduction of linolenate in soybean oil than the 5 percent copper-on-silica gel. However, the selectivity ratios of 8-12 compared favorably with those obtained with commercial copper-chromite catalysts. The 15-20 percent copper-on-silica gel catalysts can be reused three times without appreciable loss of activity and they compare favorably with the 5 percent copper-on-silica gel catalysts. However, the latter have greater activity, reuse characteristics, and selectivity comparable to commercial copper-chromite catalysts. (Snyder-Battelle)
W72-09346

LANTHANIDE SHIFT REAGENTS AS AN AID IN THE NMR ANALYSIS OF THE NORMAL ALCOHOLS C6 TO C11,
Texas A and M Univ., College Station. Dept. of Chemistry.
F. J. Smentowski, and R. D. Stipanovic.
Journal of the American Oil Chemists' Society, Vol 49, No 1, p 48-51, January 1972. 2 fig, 3 tab, 12 ref.

Descriptors: *Spectroscopy, *Alcohols, Lipids, Spectrometers, Methylene, Acids, *Nuclear magnetic resonance, Organic compounds.
Identifiers: *Fatty alcohols, Fatty acids, Lanthanide shift, Tris praseodymium, Esters, Hexanol, Heptanol, Octanol, Nonanol, Decanol, Undecanol, Lanthanide shift reagents, Tris (2,2,6,6-tetramethylheptanedionate) praseodymium (III), Tris (Dipivalomethanato)-europium (III).

Scientists have found that the addition of tris (dipivalomethanato)-europium (III) (Eu (DPM)3) and the bis-pyridine adduct to certain compounds induces large chemical shifts in the NMR spectra. This technique was used in analyzing a series of six fatty alcohols (C6-C11) with a Varian HA-100

spectrometer at 31.2-31.3 C, probe temperature and the lanthanide shift reagent, tris (2,2,6,6-tetramethylheptanedionate) praseodymium (III) (Pr (DPM)3). There resulted shifts in the resonances of the various methylene groups in the chain depending on their position with respect to the hydroxy group. The paramagnetic shift for the first seven methylenes of the six alcohols was found to be directly proportional to the amount of Pr (DPM)3 added. Pr (DPM)3 was preferred to Eu (DPM)3 because smaller amounts of the reagent produce comparable shifts and it has the same advantage as the latter; it is not unduly broadened. The coupling constants for the methylene groups in the chain were measured and tabulated. The power of lanthanide shift reagents for both analytical and conformational information derived from their NMR spectra is demonstrated. Based on the results obtained such a technique should prove to be an asset in the analysis of fatty and their derivatives. (Mortland-Battelle)
W72-09347

THE SEASONAL SELECTION BY TEMPERATURE OF HETEROTROPHIC BACTERIA IN AN INTERTIDAL SEDIMENT,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 05C.
W72-09350

IMPROVED CONTINUOUS RADIO GAS CHROMATOGRAPHY OF HYDROGEN-3-- AND CARBON-14--LABELLED COMPOUNDS USING HYDROCRACKING,
Karolinska Institutet, Stockholm (Sweden). Dept. of Clinical Chemistry.
R. Blomstrand, J. Gurtler, L. Liljeqvist, and G. Nyborg.
Analytical Chemistry, Vol 44, No 2, p 277-279, February 1972. 2 fig, 2 tab, 11 ref.

Descriptors: *Gas chromatography, *Radioactivity techniques, Tritium, Ionization, Methane, Calibrations, Tracers.
Identifiers: Biosynthesis, Biopsy, Lymphocytes, Radio gas chromatography, Carbon-14, Fatty acids, Hydrocracking, Hydrogen-3, Flame ionization detector, Methyl esters, Esters, Biological samples, Gas liquid chromatography, Liver, Hydrogen radioisotopes.

A radio gas chromatographic procedure for determining specific activities of carbon-14- and hydrogen-3-labelled fatty acids in biological samples utilizes hydrocracking of the chromatography effluent in combination with a flame ionization detector and a proportional detector. The total effluent of a gas chromatograph is passed through a hydrocracking tube followed by division of the produced methane by a splitter at room temperature. The splitter feeds the external flame ionization detector and the proportional detector. This approach permits continuous analyses of carbon-14 and hydrogen-3-labelled compounds, using programmed GLC without split ratio variations and contaminations of the flow system. Furthermore an injection device is described which allows introduction of precise amounts of mass and radioactivity. The arrangement has been tested by using labelled medium- and long-chain fatty acid methyl esters in connection with studies on lipid biosynthesis of human lymphocytes and liver biopsies in the laboratory. (Mortland-Battelle)
W72-09352

A COMPARISON OF SOME READY-FOR-USE THIN LAYERS FOR THE SEPARATION OF HEAVY METALS WITH BUTANOL-3 N HCL,
Consiglio Nazionale delle Ricerche, Rome (Italy). Laboratorio di Cromatografia.
T. Prosperi, and M. Lederer.
Journal of Chromatography, Vol 65, No 2, p 460-462, February 23, 1972. 1 fig, 3 ref.

Descriptors: *Heavy metals, Iron, Cobalt, Nickel, Gold, Mercury, Chemical analysis, Solvents, Carriers, Ions, Cellulose, *Separation techniques, *Ion exchange, *Chromatography.
Identifiers: *Thin layer chromatography, Acetylated cellulose, Butanol, Hydrochloric acid, Thin layers, *Anion exchange, Partitioning.

A survey of commercial ready-for-use thin layers to determine their suitability in separating heavy metals with butanol-3N HCl showed that anion-exchange celluloses (i.e., DEAE-cellulose and Ecteola-Cellulose) can combine partition with anion exchange and that polyamide II layers invert the usual sequence of R sub f values. Carboxymethyl cellulose yielded consistently lower R sub f values for fast moving spots and the same R sub f values for slow moving spots. The lowering was explained by the high polarity of the stationary phase leading to a different distribution of butanol, water, and hydrochloric acid between the support and the moving solvent. A number of other thin layers were found unsuitable for separation of heavy metal ions with partition solvents. Those unsuitable with butanol-3N HCl were all thin layers of aluminum foil (which reduces metals such as Au (III) and Hg (II)); several silica gels and alumina layers; and polyamide 6 (MN) and acetylated cellulose layers. (Mackan-Battelle)
W72-09353

RAPID DETERMINATION OF SOME TRANSURANIUM ELEMENTS IN BIOLOGICAL MATERIAL BY LIQUID SCINTILLATION COUNTING,
Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Strahlenbiologie.
A. Seidel, and V. Volf.
Journal of Applied Radiation and Isotopes, Vol 23, No 1, p 1-4, January 1972. 1 tab, 14 ref.

Descriptors: *Radiochemical analysis, *Radioactivity, Analytical techniques, Methodology.
Identifiers: *Biological samples, *Transuranium elements, *Scintillation counting, Detection limits, Plutonium radioisotopes, Americium radioisotopes, Curium radioisotopes, Urine, Blood, Feces, Plasma, Kidney, Liver, Lungs, Bone, Spleen, Chemical recovery, Plutonium-239, Americium-241, Curium-244.

A rapid, simple method which combines acid digestion and the use of an emulsion scintillant can be used for counting plutonium-239, americium-241, and curium-244 in biological materials. Recovery and counting efficiencies have been established using inactive biological samples spiked with 10 microliters of the elements. Samples that were spiked before or after digestion gave no recovery and counting efficiency was 98 plus or minus 0.7 percent, 99 plus or minus 0.5 percent, and 98 plus or minus 0.7 percent, respectively, for Pu-239, Am-241, and Cm-242. In a wide range, counting efficiency is independent of organic residues and quenching factors. The lower detection limit for each radionuclide was approximately 10 proton-Curies per sample. For fresh tissues, the lower detection limit was about 20 proton-Curies/g and 0.3 neutron-Curies/g for fecal ash. This method is especially suitable for small animal experiments. (Holoman-Battelle)
W72-09354

CONTRIBUTION OF THE STUDY OF ZOOPLANKTON IN LEBANESE WATERS, (CONTRIBUTION A L' ETUDE DU ZOOPLANCTON DES EAUX LIBANAISES),
Lebanese Univ., Beirut. Faculty of Sciences.
S. Lakkis.
Marine Biology, Vol 11, No 2, p 138-148, November 1971. 2 fig, 2 tab, 25 ref. English summary.

Descriptors: *Zooplankton, Surface waters, *Copepods, Crustaceans, Systematics, Protozoa, Annelids, Mollusks, Phytoplankton, Diatoms, Dinoflagellates, Amphipoda, Larval growth stage, Fish eggs, Sea water, Biomass, Coasts, Hydrologic properties, Chrysophyta.
Identifiers: *Lebanon, Ctenophores, Siphonophores, Macroinvertebrates, Chaetognaths, Cladocera, Ostracoda, Tunicates, Peridinium depressum, Ceratium furca, Ceratium fusus, Ceratium tripos, Dinophysis tripos, Chaetoceros, Nitzschia, Thalassionema, Thalassiothrix, Bacteriastrum, Rhizosolenia, Zanclea sessilis, Podocoryne carnea, Eirene viridula.

A study of zooplankton of the Lebanese coastal waters has been carried out for the first time. Thirty three net samples were taken from the surface and 10 m depth at 8 different stations, using 2 planktonic nets of different sizes. One hundred and ten species and genera of zooplankton were identified and the relative abundance of species was noted. Copepods constitute the major fraction of zooplankton (50 percent of the total species and about 75 percent of the total biomass). Most zooplanktonic groups are represented. (Holoman-Battelle)
W72-09355

INFLUENCE OF 2,4-DINITROPHENOL ON RESPIRATION AND CONCENTRATION OF SOME METABOLITES IN EMBRYOS OF THE HERRING CLUPEA HARENGUS, (EINFLUSS VON 2,4 DINITROPHENOL AUF DIE ATMUNG UND DIE KONZENTRATION EINIGER METABOLITE BEI EMBRYONEN DES HERINGS CLUPEA HARENGUS),
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 05C.
W72-09356

CHALCOCITE OXIDATION AND COUPLED CARBON DIOXIDE FIXATION BY THIOBACILLUS FERROOXIDANS,
Brigham Young Univ., Provo, Utah. Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W72-09359

EFFECTS OF ORGANOCHLORINE INSECTICIDES ON BACTERIAL GROWTH, RESPIRATION AND VIABILITY,
University Coll. of Wales, Aberystwyth. Dept. of Biochemistry; and University Coll. of Wales, Aberystwyth. Dept. of Agricultural Biochemistry.
For primary bibliographic entry see Field 05C.
W72-09361

A PRELIMINARY INVESTIGATION OF BOTTOM FAUNA AND INVERTEBRATE DRIFT IN AN UNREGULATED AND A REGULATED STREAM IN ALBERTA,
Calgary Univ. (Alberta). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-09362

RELEASE OF DISSOLVED ORGANIC MATTER FROM NATURAL POPULATIONS OF MARINE PHYTOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W72-09363

RESPONSE OF ESCHERICHIA COLI B/R TO HIGH CONCENTRATIONS OF SUCROSE IN A NUTRIENT MEDIUM,
Pennsylvania State Univ., University Park. Dept. of Biophysics.
For primary bibliographic entry see Field 05C.
W72-09364

GAS CHROMATOGRAPHIC ANALYSIS OF THE HIGHER FATTY ACIDS OF THE ALGA CHLORELLA VULGARIS (PYRENOIDOSA),
Institute for Research, Production and Uses of Radioisotopes, Prague (Czechoslovakia).

M. Matucha, L. Zilka, and K. Svihel.
Journal of Chromatography, Vol. 65, No. 2, p 371-376, February 23, 1972. 5 fig, 1 tab, 20 ref.

Descriptors: Chemical analysis, *Algae, Columns, Organic acids, Separation techniques, *Chromatography.
Identifiers: *Fatty acids, *Gas liquid chromatography, Methyl esters, Esters, Chlorella vulgaris, Sample preparation.

Labeled (C-14) fatty acids were prepared from radioactive Chlorella vulgaris for gas-liquid chromatography by the following procedure. Lipids were extracted from extracted and washed cells with 96 percent ethanol and an ethanol-diethyl ether mixture; remaining sugars were removed from the lipid extract by water extraction. The dried lipids were then transesterified with methanolic hydrochloric acid. After extraction of the methylesters by petroleum ether, they were purified by vacuum sublimation. To identify Chlorella fatty acids with a relative abundance higher than 0.5 percent, a polar polyester diethylene glycol succinate (DEGS) and a non-polar grease, Apiezon-L, were chosen as stationary phases. G-L chromatography was carried out on a column 2 m long and 4mm I.D. filled with 15 percent DEGS with an argon-ionization detector and on a column 1.5 m long and 3 mm I.D. filled with 15 percent Apiezon with a flame-ionization detector. A 2 ml gas proportional counter gave a simultaneous determination of radioactivity. In addition to the major acids (palmitic, oleic, linoleic, and linolenic), even-numbered, straight-chain fatty acids and odd-numbered, saturated fatty acids were found. (Mackan-Battelle)
W72-09365

ORGANIC RADICAL-ION SALTS AS SELECTIVE ELECTROCHEMICAL SENSORS,
Umea Univ., (Sweden). Dept. of Analytical Chemistry.
M. Sharp.
Analytica Chimica Acta, Vol. 59, No. 1, p 137-142, March 1972. 1 fig, 1 tab, 10 ref.

Descriptors: *Electrochemistry, Laboratory equipment, *Electrodes, Organic compounds, Ions, *Salts, Iron, Copper, Anions, Cations, Nitrates, Chemical analysis, Aromatic compounds, Heavy metals, Lead.
Identifiers: *Ion selective electrodes, Cell potentials, TNAP, DTF, TFM, TCNQ, Chemical interference, Selectivity coefficients, Cyanides, Electron mobility.

Three semiconductory organic radical-ion salts were obtained chemically and used as the active components of solid-state ion-selective electrodes. TNAP (11,11,12,12-tetracyanonaphtho-2,6-quinodimethan), DTF (9-dicyanomethylene-2,4,7-trinitrofluorene), and TFM (2,4,5,7-tetranitrofluoren-delta 9 alpha-malononitrile) were chosen because of their ranges of activity, low solubility in aqueous solutions, and electron mobility and were fabricated into nine electrodes constructed from lead, copper, and tetraphenylarsonium salts of the anions according to the previous technique of Sharp and Johansson. Response characteristics were determined in unbuffered aqueous solutions of lead nitrate, copper (II) nitrate, and tetraphenylarsonium chloride. Approximate selectivity parameters were derived from measurements made in 0.1 M solutions of suitable salts of the interfering cation. Variations in cell potential were measured at 25 degrees with a digital pH meter. Single ion activities were evaluated from the extended Debye-Huckel relation using the Kielland ion size parameters. In all cases the three salts containing a given cation showed similar behavior. Essentially Nernstian response curves were obtained over the cation activity ranges studied (0.1 M-1.0 micro M). Silver (I) and mercury (II) were found to interfere strongly in all cases by the formation of the corresponding insoluble salts on the electrode surface. However, excellent calibration graphs were obtained with lead (II), copper (II), and tetraphenylarsonium ions. (Mackan-Battelle)
W72-09366

THE TOLUENE EXTRACTION OF SOME ELEMENTS AS IODIDES FROM SULPHURIC ACID-POTASSIUM IODIDE MEDIA. APPLICATION TO NEUTRON ACTIVATION ANALYSIS. PART 1. EXTRACTION BEHAVIOUR OF AS, AU, BI, BR, CD, CU, GA, GE, IN, HG, MO, PB, SB, SE, SN, W AND ZN,
Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).
A. R. Byrne, and D. Gorenc.
Analytica Chimica Acta, Vol. 59, No. 1, p 81-89, March 1972. 5 fig, 1 tab, 16 ref.

Descriptors: *Separation techniques, *Trace elements, *Neutron activation analysis, *Radioisotopes, Analytical techniques, Heavy metals, *Iodides, Gold, Bromine, Cadmium, Copper, Mercury, Lead, Molybdenum, Zinc, Tracers, Arsenic radioisotopes, Gold radioisotopes, Cadmium radioisotopes, Lead radioisotopes, Zinc radioisotopes, Spectrometers, Radioactivity techniques.
Identifiers: Antimony, Tin, Arsenic, Bismuth, Gallium, Germanium, Indium, Selenium, Tungsten, *Toluene extraction, Potassium iodide, Benzene, Bismuth radioisotopes, Bromine radioisotopes, Copper radioisotopes, Gallium radioisotopes, Germanium radioisotopes, Indium radioisotopes, Mercury radioisotopes, Molybdenum radioisotopes, Selenium radioisotopes, Tungsten radioisotopes, Sulfuric acid, Scintillation counting, Biological samples, Antimony radioisotopes, Tin radioisotopes, Sample preparation.

The solvent extraction with toluene of 17 elements as iodides from sulfuric acid-potassium iodide media was investigated to develop separation techniques utilizing neutron activation analysis. A suitable volume of 15 N sulfuric acid was pipetted into an extraction vessel followed by dropwise addition of a radiotracer solution. Potassium iodide solution of either 5 M or 0.5 M concentration was then added and the volume was adjusted to 10.0 ml with water. After addition of 10.0 ml toluene, the vessel was placed in a water bath at 25 C for 10 min. The activities were measured after 3 min. shaking and several minutes allowed for separation. Bromine, cadmium, copper, gallium, gold, indium, molybdenum, tungsten, and zinc were not extractable, whereas the extraction of bismuth and lead was small. Extraction curves are presented for arsenic, antimony, mercury, lead, and tin, for which quantitative extraction under specific conditions provides useful separation from other elements. Selenium was also extractable, but under very special conditions. On the basis of the results, a method for determination of arsenic and antimony in irradiated biological material was developed, and is discussed in a separate paper. A simple solvent extraction method for determination of tin in such materials was also developed. (See also W72-09368) (Mortland-Battelle)
W72-09367

THE TOLUENE EXTRACTION OF SOME ELEMENTS AS IODIDES FROM SULPHURIC ACID-POTASSIUM IODIDE MEDIA. APPLICATION TO NEUTRON ACTIVATION ANALYSIS. PART II. DETERMINATION OF ARSENIC AND ANTIMONY IN BIOLOGICAL MATERIALS AT SUBMICROGRAM LEVELS,
Nuklearni Institut Jozef Stefan, Ljubljana (Yugoslavia).
A. R. Byrne.
Analytica Chimica Acta, Vol. 59, No. 1, p 91-99, March 1972. 2 fig, 2 tab, 8 ref.

Descriptors: *Neutron activation analysis, *Arsenic radioisotopes, Iodides, Separation techniques, Radioactivity techniques, Radioisotopes, *Trace elements, Methodology.
Identifiers: *Antimony, Biological samples, Arsenic, Toluene, Tin, Kale, Tin radioisotopes, Antimony radioisotopes, Hair, Sample preparation, Errors, Chemical interference, Chemical recovery, Wet ashing, Blood, Detection limits.

A method is described for the neutron activation analysis of arsenic and antimony simultaneously in biological materials at submicrogram levels, based on the differences in the extraction behavior of the iodides from sulfuric acid-potassium iodide medium with toluene. Both elements are first extracted from the sulfuric acid solution of the wet-ashed residues and then successively and selectively washed out of the organic phase in quantitative yield. Checks on losses during wet ashing, the validity of the extraction steps, and the complete procedure for both elements are reported. Results are presented for Bowen's standard kale and the N.B.S. standard, orchard leaves SRM 1571. Errors and interferences are discussed. (See also W72-09367) (Mortland-Battelle)
W72-09368

THE DETERMINATION OF TRACES OF NICKEL BY GAS-LIQUID CHROMATOGRAPHY,
Birmingham Univ. (England). Dept. of Chemistry.
R. S. Barratt, R. Belcher, W. I. Stephen, and P. C. Uden.
Analytica Chimica Acta, Vol. 59, No. 1, p 59-73, March 1972. 9 fig, 5 tab, 25 ref.

Descriptors: *Gas chromatography, *Nickel, *Trace elements, Analytical techniques, Lipids, Aqueous solutions, Mass spectrometry, Data analysis, Iron, Copper, Heavy metals, Separation techniques.
Identifiers: Tea, Chemical interference, Sample preparation, Electron capture detectors, Gas liquid chromatography, Detection limits, Chemical recovery, Atomic absorption spectrophotometry.

A rapid and sensitive method for the determination of trace amounts of nickel has been developed in which a volatile nickle chelate is analyzed by gas-liquid chromatography. A Philips PV400 research gas chromatograph with a Pye electron capture detector was used in all experiments. Oxygen-free nitrogen at a flow rate of 90 ml/min was the carrier gas. The column temperature was maintained at 170 C. Thermal analysis was carried out on a Perkin Elmer TGS-1 thermobalance, and atomic absorption measurements were obtained with a Varian Techtron AA-5 atomic absorption spectrophotometer fitted with a 6-in air-acetylene burner. Nickel was extracted from an aqueous solution at pH 4.5-5.0 with a solution of monothiotrifluoroacetylacetone in n-hexane. The extraction procedure gave recoveries in excess of 90 percent. The extract was then washed with sodium hydroxide solution (0.01 M) and the nickel determined by gas chromatography on a 4-ft teflon column. The method provides detection of nickel down to 5 times 10 to the minus 11 grams. Chemical interference from other ions (Hg (I), Cd (II), Zn (II), Mn (II), Hg (II), Co (II), Pt (II), Cr (III), Al (III), Fe (III), Sn (IV), V (V), Cu (I)) was also investigated. Most severe interference occurred with copper (II) and could be eliminated by preliminary treatment of the solution with hydrogen sulfide. The results of the analyses show good agreement with independent analyses. (Synder-Battelle)
W72-09369

FACTORS INVOLVED IN THE ISOLATION OF CLOSTRIDIUM PERFRINGENS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Anaerobe Lab.
L. D. Smith.
Journal of Milk and Food Technology, Vol. 35, No. 2, p 71-76, February 1972. 9 tab, 46 ref.

Descriptors: *Isolation, *Clostridium, Separation techniques, Cultures, Food processing industry, Temperature, Hydrogen ion concentration, *Growth rates, Sodium chloride, Oxidation-reduction potential, Chemical compounds, Nutrients, Sulfur compounds, Laboratory equipment.
Identifiers: *Selective media, *Clostridium perfringens, Sulfites, Neomycin, Polymyxin, Sulfadiazine, Kanamycin, Cycloserine, Eh, Pour plate, Roll tubes, Most probable number test,

Sample preservation, Differential media, Culture media.

An evaluation of isolation techniques and factors affecting the growth of Clostridium perfringens on selective media showed that quantitative isolation requires that dilutions be made anaerobically; that a relatively complete medium be used; that incubation be under strictly anaerobic conditions, or that the medium contain an active reducing agent. Roll tubes, pour plates, or surface inoculated plates may be used if other conditions are suitable. Chemical agents selective for Clostridium perfringens include sulfite, neomycin, polymyxin, sulfadiazine, kanamycin and cycloserine. Media using these agents, such as SFP, TSN, and SPS, have been devised, but all cause some inhibition of Clostridium. The MPN (most probable number) technique allows estimation of living cell numbers in food or other material, whereas determination of phospholipase C in a medium provides an index of previous active organisms which have been killed by freezing or cold storage. (Mackan-Battelle)
W72-09370

EFFECTS OF INCUBATION TEMPERATURE ON THE SALT TOLERANCE OF SALMONELLA,
Washington Univ., Seattle. Inst. for Food Science and Technology.
For primary bibliographic entry see Field 05C.
W72-09371

A PRACTICAL ON-STREAM PARTICLE SIZE ANALYSIS SYSTEM,
Milltronics Ltd., Peterborough (Ontario).
For primary bibliographic entry see Field 07B.
W72-09372

MORE ACCURATE GAS-CHROMATOGRAPHIC ANALYSIS USING FLAME-IONIZATION DETECTOR,
Monsanto Co., Texas City, Tex.
B. Y. K. Pan.
ISA Transactions, Vol. 10, No. 4, p 363-368, 1971. 2 fig, 2 tab, 6 ref.

Descriptors: *Gas chromatography, Flow rates, *Weight, Measurement, Laboratory equipment, Computers, Data processing.
Identifiers: *Flame ionization detectors, *Chromatography peaks, Benzene, Ethylbenzene, Toluene, Styrene, Methylstyrene, Precision.

When sample size and component concentrations are varied in quantitative gas chromatographic analysis, it is difficult to assure a linear relationship between peak areas and component weights. This problem can be overcome by using a 15 ft. x 1/8 in. column packed with 10 percent tetracyanoethylated pentaerythritol (TCEPE) on red chromosorb and a hydrogen flame ionization detector (temperatures: column-105 C, detector-280 C; flow rates: carrier-20.7 ml/min, hydrogen-19.3 ml/min, air-223 ml/min). Volumes of 0.1 to 0.5 microliters of synthetic samples containing benzene, toluene, ethylbenzene, and styrene (with or without alpha-methylstyrene) were injected with a Hamilton syringe using a sample split of 1:10 to reduce the sample entering the column. Elution time was about 18 min.; all peaks were integrated with an IBM 1800 computer. Benzene was chosen or added as reference and its sensitivity assigned as 1.00. The relative sensitivities of other components were correlated linearly with their observed peak areas. Afterwards, all observed peak areas were corrected with their corresponding relative sensitivities and normalized to give weight percents. In comparing with the known values, this method resulted in less than 1.5 percent deviation in the range studied and less than 5 percent deviation on extrapolation beyond the range. (Mackan-Battelle)
W72-09373

WATER POLLUTION MONITORING STATIONS: AN OUNCE OF PREVENTION,
Honeywell Inc., Fort Washington, Pa.
J. O. Johnson, Jr.
ISA Transactions, Vol. 10, No. 4, p 340-347, 1971. 11 fig, 10 ref.

Descriptors: Water pollution, *Water sampling, *Stations, *Monitoring, Water types, Data collections, Installation, Equipment, Pumps, Water analysis, Maintenance, *Sampling.

Some basic considerations which must be dealt with to insure the reliability of water pollution monitoring stations are described. Water conditions, sampling methods, system selection and plumbing (pump selection and mounting), methods of installation, periodic service, and winterizing of water pollution monitoring stations are briefly discussed. (Synder-Battelle)
W72-09374

THE DETERMINATION OF OIL-SOLUBLE SULPHONATES BY TWO-PHASE TITRATION,
Esso Research Centre, Abingdon (England).
P. I. Brewer.
Journal of the Institute of Petroleum, Vol. 58, No. 559, p 41-46, January 1972.

Descriptors: *Volumetric analysis, *Sulfonates, Chemical analysis, Oil, Solubility, Metals, Acidity, Dyes.
Identifiers: *Two-phase titration, *Oil soluble sulfonates, Hyamine, Sulfuric acids, Chloroform, Sodium sulfonate, Calcium sulfonate, Magnesium sulfonate, Barium sulfonate, Indicators, Equivalent weight.

A rapid, precise two-phase titration method for determining the anionic activity of sulphonates is presented in which the sulphonate is dissolved in chloroform and titrated with a quaternary ammonium salt (Hyamine 1622) in the presence of very dilute sulphuric acid. The indicator is a mixture of the cationic dye-stuff dimidium bromide (dBr) and the anionic dyestuff disulphine blue (dbl). At the beginning the dBr forms a complex with the sulphonate coloring the lower chloroform layer red. During titration Hyamine 1622 displaces the dBr in the complex; when excess Hyamine 1622 is present it forms a chloroform soluble blue complex with the dbl. Thus, near the end point a color change takes place: red through grey to blue. The grey is taken to be the end point. This method has been applied to sodium, calcium, barium, and magnesium salts and is probably applicable to other metal sulphonates. A method for determining the equivalent weight of the sulphonate is also given which is more rapid and not subject to the interferences of previous methods. (Mackan-Battelle)
W72-09375

THE ANALYSIS OF NITROGEN CONTAINING POLYMERIC ASHLESS OIL DISPERSANTS BY DIALYSIS AND ALUMINA CHROMATOGRAPHY,
Continental Oil Co., Ponca City, Okla.
A. B. Carel.
Journal of the Institute of Petroleum, Vol. 58, No. 559, p 34-40, January 1972. 2 fig, 5 tab, 4 ref.

Descriptors: *Separation techniques, *Dialysis, Nuclear magnetic resonance, *Additives, *Gas chromatography, Lubricants, Chemical analysis, Nitrogen, Oil, Nitrogen compounds, Calibrations, *Infrared radiation.
Identifiers: Polyisobutylene, Gas liquid chromatography, *Alumina chromatography, *Ashless oil dispersants, Polyamides, Polyimides, Esters, Diluent oils, Paraffins, *Oil characterization.

Alumina chromatography and dialysis procedures were used to isolate the total active species from diluent polyamide, polyimide, and ester type commercial lubricant additives. Infrared, nuclear magnetic resonance, and gas chromatographic techniques were used to follow the isolation and to determine the type and amount of diluent oils and the percentage of unreacted or added polyisobutylene. The IR data were obtained at 2.5 to 15 microns (with carbon tetrachloride from 0 to 7.5 and carbon disulfide from 7.5 to 15 microns). A flame ionization detector and a 6 ft SE-52 column were used with the GLC. Standard blends of known amounts of commercial polyisobutylene in paraffin hydrocarbon oils were prepared as calibration standards for IR and NMR. NMR was selected for analysis of polyisobutylene in hexane fractions. The determination of percent oil, polyisobutylene, and active components of the ashless oil dispersants was accomplished allowing for further isolation, characterization, and investigation of the active components. (Mackan-Battelle)
W72-09376

SUNLIGHT PHOTOCHEMISTRY OF FERRIC NITRILOTRIACETATE COMPLEXES,
Carleton Univ., Ottawa (Ontario). Dept. of Chemistry.
T. Trott, R. W. Henwood, and C. H. Langford.
Environmental Science and Technology, Vol. 6, No. 4, p 367-368, April 1972. 1 tab, 11 ref.

Descriptors: *Nitrilotriacetic acid, Chemical degradation, *Iron, Ions.
Identifiers: *Degradation products, *Photodecomposition, Metal-NTA complexes, Complexing agents, Photochemistry, Fate of pollutants.

Ferric-NTA complexes undergo photochemical degradation using irradiation characteristic of sunlight; the acidic solution monomeric and the basic solution monomeric and dimeric Fe-NTA complexes also undergo photochemical degradation under natural water conditions. In initial experiments, solutions containing 0.010 M ferric ion and 0.010 M NTA adjusted to pH 4-8 were irradiated outdoors in borosilicate glass flasks under varying light conditions. In all experiments, precipitation of iron was complete in less than 14 days, indicating extensive degradation of NTA; no reaction was observed in dark controls. In order to determine what products were formed, solutions were irradiated in a Rayonet photoreactor equipped with fluorescence-coated mercury lamps to greater than 10 percent loss of NTA. The degradation producets detected were CO2, CH20, and iminodiacetic acid (IDA). The efficiency declines somewhat with increasing pH but quantum yields above approximately 0.01 may be expected in all natural waters. The evidence for such photodegradation serving as a mechanism to limit accumulation of NTA in natural water is discussed. (Holoman-Battelle)
W72-09379

GAS-LIQUID CHROMATOGRAPHIC DETERMINATION OF FURFURAL IN AQUEOUS SOLUTION,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Organic Synthesis.
A. Ya. Karmil'chik, V. V. Stonkus, and E. K. Korchagova.
Zhurnal Analiticheskoi Khimii, Vol 26, No 6, p 1231, June 1971.

Descriptors: *Gas chromatography, *Aqueous solutions, Pollutant identification, Methodology, Water analysis, Industrial wastes, Organic compounds.
Identifiers: *Furfural, Turpentine, *Acetic acid, *Methanol, Chemical interference, Detection limits, Aldehydes, Heterocyclic hydrocarbon, Flame ionization detectors, Errors.

A Tsvet-1 chromatograph fitted with a flame-ionization detector was used to determine furfural in the presence of methanol, acetic acid, and turpentine over the concentration ranges usually found in commercial hydrolyzates and preheater condensates from hydrolysis, furfural, and peat plants. Several stationary phases and solid supports were tested, and the optimal chromato-

graphic conditions were found to be: a 2-meter column with an internal diameter of 0.4 cm, column temperature 130C, carrier-gas (argon) flow rate 24 ml/min, hydrogen flow rate 40 ml/min, air flow rate 260 ml/min, and 5 microliter test samples. The results obtained during the analysis of synthetic aqueous solutions indicated that the presence of methanol, acetic acid, and turpentine did not affect the accuracy of the quantitive determination of furfural. The maximum relative error was 7 percent over a furfural concentration range of 0.0004-8.0 percent. A complete analysis can be done in 4 minutes. (Snyder-Battelle)
W72-09403

STUDY OF CRUDE OIL AND SOME OF ITS HIGH MOLECULAR COMPOUNDS USING ELECTRON PARAMAGNETIC RESONANCE (REVIEW),
Akademiya Nauk SSSR, Ufa. Bashirskii Filial.
V. S. Khristoforov.
Khimiya i Tekhnologiya Topliv i Masel, Vol 7, No 8, p 57-59, August 1971. 1 fig, 26 ref.

Descriptors: *Oil, *Analytical techniques, Organic compounds, Oxygen, Heavy metals, *Resonance, *Reviews.
Identifiers: *Electron paramagnetic resonance, *Asphaltenes, Vanadium, Free radicals, Crude oil.

A review of experiments in which crude oil and some of its high molecular compounds were studied by electron paramagnetic resonance showed that a majority of raw crudes exhibit EPR absorption. In the studies, EPR was used for quantitative determination of vanadium in crudes, for determining concentrations of free radicals in samples of petroleum crudes which do not contain vanadium, and for determining concentrations of dissolved oxygen in crudes and petroleum products. The studies also suggest that the asphaltene content of crudes and asphaltene naphthenic hydrocarbons can be measured by the EPR method. EPR was also used to study fifteen bituminous compounds, eleven of which were asphaltenes, and two tarry fractions prepared in the laboratory from unpurified crudes. (Snyder-Battelle)
W72-09404

A DIRECT METHOD OF MEASURING BENTHIC PRIMARY PRODUCTION IN STREAMS,
Connecticut Univ., Storrs. Dept. of Biology.
E. W. Hansmann, C. B. Lane, and J. D. Hall.
Limnology and Oceanography, Vol 16, No 5, p 822-826, September 1971. 1 fig, 16 ref.

Descriptors: *Primary productivity, *Photosynthesis, *Respiration, Biological communities, *Benthic fauna, *Benthic flora, Equipment, Streams, Bioassay.

Porcelainized steel trays were placed in riffle areas, partially filled with rock and gravel from the streambed, and left for one month to permit the disturbed benthic community to reestablish itself. The tray was covered by transparent plastic to isolate it from the stream and form a chamber containing a portion of the benthic community. Three small pumps were used to pump water from the stream into an elevated reservoir and to circulate the water at 200 ml/min from the reservoir through the chamber. Stream, chamber, and reservoir water temperatures were measured hourly. Photosynthesis and respiration rates were calculated from measurements of dissolved oxygen in influent and effluent streams during light and dark hours. Gross primary production per hour was estimated by adding mean community oxygen consumption during dark periods to net oxygen evolved during photosynthesis (photosynthesis minus respiration). Several runs were made in Oregon streams during the spring, summer, and fall of 1967. The gross primary production (g 02/square meter/day) ranged from 0.5-2.5 g 02/square meter/day. The method eliminates diffusion calculations and is adaptable to various chemical analyses used to determine rates of production. (Mackan-Battelle)
W72-09405

DIURNAL UPTAKE OF NO3 AND NH4 BY A CERATOPHYLLUM-PERIPHYTON COMMUNITY,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-09406

MECHANISM OF THE GROWTH INHIBITORY EFFECT OF CYSTEINE ON ESCHERICHIA COLI,
Debrecen Univ. of Medicine (Hungary). Dept. of Pharmacology.
For primary bibliographic entry see Field 05C.
W72-09407

NUCLEIC ACID ENZYME STUDIES OF NONFERMENTATIVE GRAM-NEGATIVE BACTERIA USING THIN-LAYER CHROMATOGRAPHY,
Minnesota Univ., Minneapolis. Dept. of Laboratory Medicine.
M. M. Klein, and D. J. Blazevic.
Applied Microbiology, Vol 23, No 2, p 276-280, February 1972. 2 tab, 21 ref.

Descriptors: *Fluorescence, *Systematcis, Cultures, *Chromatography, Pseudomonas, *Aerobic bacteria, Acids, Synthesis, Incubation, *Enzymes, Isolation, Bacteria.
Identifiers: *Agars, *Thin layer chromatography, Pseudomonas multivorans, Pseudomonas cepacia, Pseudomonas maltophilia, Pseudomonas aeruginosa, Pseudomonas putida, Pseudomonas stutzeri, Herella vaginicola, Cram-negative bacteria, Nucleic acids, Guanine, Guanosine, Uric acid, Nucleoside phosphotransferase, Serratia marcescens, Pseudomonas pseudomallei, Pseudomonas mallei, Pseudomonas diminuta, Pseudomonas fragi, Pseudomonas alcaligenes, Pseudomonas odorans, Pseudomonas denitrificans, Alcaligenes faecalis, Bordetella bronchiseptica, Mima polymorpha, Moraxella osloensis, Agars, Culture media, Mima, Differential media.

A rapid and easy to perform procedure for determining the nucleic acid enzyme reactions of intact bacterial cells was developed. Overnight organism growth on triple sugar agar was tested for nucleoside phosphotransferase, nucleosidase, and nucleotidase activity. Reaction products were detected by means of thin-layer chromatography and fluorescence. Characteristic patterns were seen with certain strains of nonfermentative gram-negative bacteria, which indicated that these tests could aid in classification and identification of EO-1 group, Pseudomonas multivorans, Pseudomonas cepacia, Pseudomonas maltophilia, certain other Pseudomonas species, and Herellea vaginicola. (Mortland-Battelle)
W72-09408

NUCLEAR MAGNETIC RESONANCE STUDY OF INTERACTION BETWEEN ANIONIC AND NONIONIC SURFACTANTS IN THEIR MIXED MICELLES,
Kao Soap Co., Wakayama (Japan). Industrial Research Lab.
F. Tokiwa, and K. Tsujii.
Journal of Physical Chemistry, Vol 75, No 23, p 3560-3565, November 11, 1971. 5 fig, 1 tab, 13 ref.

Descriptors: *Nuclear magnetic resonance, Spectroscopy, Linear alkylate sulfonates, Ethers, Organic compounds, Anions, Physicochemical properties, Aqueous solutions, *Surfactants.
Identifiers: *Micelles, *Nonionic surfactants, *Anionic surfactants, *Chemical interaction, Sodium dodecyl sulfate, Sodium para-octylbenzenesulfonate, Dodecyl polyoxyethylene ethers.

The nmr spectra of aqueous solutions of nonionic surfactants, dodecyl polyoxyethylene ethers (Cl2POE) with different number of oxyethylene units, were measured in the presence of anionic surfactants, sodium dodecyl sulfate (NaCl2S) and sodium p-octylbenzenesulfonate (NaC8BS), at different molar ratios of anionic/nonionic surfactant. When NaC8BS is added to Cl2POE solutions, the peak due to protons of the polyoxyethylene chain of Cl2POE shifts to a higher magnetic field, the extent of the upfield shift depending on the polyoxyethylene chain length of Cl2POE and the mixing ratio of NaC8BS/Cl2POE. However, this peak remains at the same position and shows no remarkable change on addition of NaCl2S. The upfield shift of the polyoxyethylene peak caused by addition of NaC8BS is ascribed to an interaction between the polyoxyethylene chain of Cl2POE and the benzene ring of NaC8BS in their mixed micelle. This interaction has been discussed in relation to the polyoxyethylene chain length of Cl2POE and the mixing ratio of NaC8BS/Cl2POE. In the mixed micelle, the number of Cl2POE molecules influenced by one NaC8BS molecule was calculated to be 0.6-1.6, depending on the polyoxyethylene chain length and nearly constant for Cl2POE with oxyethylene units larger than about 9. The number of oxyethylene units influenced by the benzene ring of NaC8BS was estimated to be about 9. (Mackan-Battelle)
W72-09410

A CRITICAL STUDY OF SOME PARAMETERS IN QUANTITATIVE IN SITU INVESTIGATIONS OF THIN-LAYER CHROMATOGRAPHY BY LIGHT ABSORPTION METHODS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Chemistry.
R. W. Frei.
Journal of Chromatography, Vol 64, No 2, p 285-295, February 2, 1972. 5 fig, 2 tab, 15 ref.

Descriptors: *Chromatography, *Cobalt, *Analytical techniques, Spectrophotometry, Evaluation, *Ions, Measurements, Performance.
Identifiers: *Thin layer chromatography, Reflectance measurement, Transmission measurement, Double beam detection, 4- (2-thiazolylazo)-resorcinol, Visible spectrum, Errors.

Cobalt (II) ions were separated on silica gel layers and sprayed with 4- (2-thiazolylazo) resorcinol (TAR). The resulting complex is purple on a yellow-orange background, providing a stable compound which absorbs in the visible spectrum. Chromatograms containing light spots of 0.2 micrograms of Co (II) were scanned as TAR complexes at 580 nm (after spraying) for both transmission and reflection modes using a Zeiss chromatogram spectrophotometer. Relative standard deviation was 4 percent for the transmission measurements and 2 percent for reflectance measurements. A double-beam Farrand VIS-UV spectrophotometer technique displayed superior detection reproducibilities compared to a single-beam mode (1.5 percent S.D.: 3.5 percent S.D.). Errors can be expected to be in the 2-5 percent range. Chromatographic rather than instrumental parameters are likely to be responsible for errors of this magnitude. It was concluded that reflectance spectroscopy is truly a quantitative method found to be superior to transmission measurements for the in situ evaluation of thin layer chromatography. This view is contrary to several others. (Mackan-Battelle)
W72-09411

VOLTAMMETRIC MEASUREMENT OF ZINC IN THE NORTHEASTERN TROPICAL PACIFIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
A. Zirino, and M. L. Healy.
Limnology and Oceanography, Vol 16, No 5, p 773-778, September 1971. 3 fig, 2 tab, 9 ref.

Descriptors: *Zinc, *Sea water, *Analytical techniques, *Pacific Ocean, Hydrogen ion concen-

tration, Sampling, Water analysis, Separation techniques, Heavy metals, *On-site tests.
Identifiers: Voltammetry, Differential anodic stripping voltammetry, On-board tests, Precision, Electrochemistry, Sample preparation, Dropping mercury electrodes.

Relative zinc concentrations in the upper 1000 m of the northeastern tropical Pacific Ocean were measured by pH-controlled differential anodic stripping voltammetry aboard ship. With this method, a 25 ml seawater sample is placed in an electrolytic cell and purged of oxygen, lowering the pH to about 5.6. Zinc and other metals in the sample are electroplated into a hanging mercury drop electrode for 5 to 15 minutes. After deposition, the reduced metals in the amalgam are oxidized and the resulting diffusion currents are measured. The current peak at approximately minus 1 V versus a saturated calomel electrode is proportional to the amount of zinc plated into the drop and the zinc concentration in solution. The process is repeated with a zinc standard added and the zinc concentration of the sample is obtained from a ratio of the zinc peak current of the sample to that of the sample plus standard. This apparatus functions well at sea; the analysis is relatively fast; no reagents are required; and preconcentration is not necessary. However, precision is poor at sea and direct comparison with other methods is not possible. In the work reported here, waters above 125 m were significantly lower in zinc than those between 125 and 1000 m. A substantial portion of the zinc appeared to be absorbed on particulate matter greater than 0.45 microns. (Mortland-Battelle)
W72-09413

SELECTIVITY OF CYCLIC POLYETHER TYPE LIQUID MEMBRANE ELECTRODES,
State Univ. of New York, Buffalo. Dept. of Chemistry.
G. A. Rechnitz, and E. Eyal.
Analytical Chemistry, Vol 44, No 2, p 370-372, February 1972. 1 fig, 4 tab, 13 ref.

Descriptors: *Electrodes, Analytical techniques, *Electrochemistry, *Ions, Cation adsorption, Alkali metals, Alkaline earth metals, Cesium, Potassium, Sodium, Ammonia, Selectivity, Attractants, Application methods, Potentiometric level, Electrical properties, Estimating equations, Organic compounds.
Identifiers: *Cyclic polyethers, *Liquid membrane electrodes, Crown compounds, Barium, Rubidium, Strontium, Formation constants, Selectivity coefficients, Dicyclohexyl-18-crown-6, Dibenzo-18-crown-6, Dibenzo-30-crown-10, Dibenzo-15-crown-5, Tetrahydrofuran, Nitrobenzene, Ion selective electrodes.

Crown compounds (cyclic polyethers) may serve as neutral carrier compounds in the membrane phase of ion selective liquid membrane electrodes based on their ability to solubilize inorganic salts in organic solvents. These compounds form complexes which accomodate the metal ion within the ring cavity after partial or complete desolvation. Cyclic polyethers tested were dicyclohexyl-18-crown-6, dibenzo-18-crown-6, dibenzo-30-crown-10, and benzo-15-crown-5. Metal ion chloride salts of potassium, rubidium, ammonia, cesium, sodium, barium, and strontium were complexed with the crown compounds. Formation constants were measured, using a Corning Model 476220 cation sensitive glass electrode, by constructing the appropriate metal ion calibration curve and then adding ligand to the solution without removing the electrode. Selectivity coefficients, with respect to the potassium ion, were determined by equipotential and equal concentration methods. Barium was used as a reference in tests of alkaline earths. Data led to the approximation: K sub sel 1,2 is approximately equal to K sub f 1/K sub f 2, where K sub sel 1,2 is the potentiometric selectivity coefficient for the electrode's response to ion 1 over ion 2, and K sub f 1 and K sub f 2 are equilibrium formation constants for complexes between the carrier entity and ion 1 and 2. Thus, it is possible to predict selectivity properties of suitable neutral carrier electrodes on the basis of homogeneous complex formation data and formation constants from electrochemical data. Development of new liquid membrane electrodes and membrane phase materials should proceed from these data. (Mackan-Battelle)
W72-09415

POSSIBLE ORIGIN OF CLOSTRIDIUM BOTULINUM CONTAMINATION OF ESKIMO FOODS IN NORTHWESTERN ALASKA,
Arctic Health Research Center, Fairbanks, Alaska.
For primary bibliographic entry see Field 05C.
W72-09417

HADAMARD-TRANSFORM SPECTROMETRY: A NEW ANALYTICAL TECHNIQUE,
Spectral Imaging, Inc., Concord, Mass.
For primary bibliographic entry see Field 02K.
W72-09418

ANALYSIS OF SMALL QUANTITIES OF SACCHARIDES IN AQUEOUS EFFLUENTS,
Salford Univ. (England).
L. S. Bark, R. L. Cooper, and K. C. Wheatstone.
Water Research, Vol. 5, p 1161-1169, December 1971. 3 fig, 2 tab, 17 ref.

Descriptors: *Sewage effluents, *Gas chromatography, *Sewage, *Chemical analysis, Effluents, Carbohydrates, Aqueous solutions, Methodology.
Identifiers: *Saccharides, Monosaccharides, Glucose, Fructose, Mannose, Galactose, Disaccharides, Lactose, Maltose, Cellobiose, Sucrose, Precision, Detection limits, Sample preparation, Retention.

A proposed method for determining low concentrations of monosaccharides in aqueous solutions involves evaporating the sample to dryness under reduced pressure at 30-35 degrees C and preparing saccharide poly-trimethylsilyl ethers for analysis by gas chromatography. Using a column of Chromosorb W (AW-DCMS) coated with 10 percent FFAP and temperature programming, the monosaccharides can be separated and determined within 15 minutes. Disaccharides must undergo acid hydrolysis prior to analysis. Fresh samples of raw, settled. partially treated, and completely treated sewage were analyzed before and after acid hydrolysis; the latter resulted in an increase in the concentration of glucose and fructose together with the appearance of other smaller peaks. The increase was due to di- and trisaccharide hydrolysis and the peaks, to galactose. Glucose ranges in raw sewage were 1-3 mg/1; in settled sewage, there was 0.2-0.3 mg/1 glucose, less than 0.2 mg/1 galactose and fructose, and 2-4 mg/1 sucrose. The method was accurate within plus or minus 10 percent for 1.0 mg/1 glucose. Repeatability of the method was within plus or minus five percent and as little as 0.5 mg/1 of each saccharide could be determined. Detection limits were 0.02 mg/1 for glucose, mannose and galactose and 0.03 mg/1 for fructose. (Holoman-Battelle)
W72-09419

MEASUREMENT OF ALPHA PARTICLE RADIOACTIVITY OF WATER.
American Society for Testing and Materials, Philadelphia, Pa.

In: 1971 Annual Book of ASTM Standards, Part 23, Water: Atmospheric Analysis, (ASTM D 1943-66-71) p. 501-505.

Descriptors: *Measurement, *Radioactivity, *Water pollution, *Water pollution sources, *Standards, Materials, Materials testing, Instrumentation, Control, *Water analysis.

This method covers the measurement of alpha particle activity of water. It is applicable to alpha emmitters having energies above 3.9 MeV and at activity levels above 0.5 pCi/ml of radioactively homogeneous water. The method is not applicable to samples containing alpha-emitting radioelements that are volatile under conditions of the analysis. The method can be used for either absolute or relative determinations. In tracer work, the results may be expressed by comparison with a standard that is defined to be 100 percent. For radioassay, data may be expressed in terms of alpha disintegration rates after calibration with a suitable standard. (Houser-ORNL)
W72-09421

STANDARD METHOD OF TEST FOR RADIONUCLIDES OF RADIUM IN WATER.
American Society for Testing and Materials, Philadelphia, Pa.

In: 1971 Annual Book of ASTM Standards, Part 23. Water: Atmospheric Analysis. (ASTM D-2460-70) p. 659-663.

Descriptors: *Measurement, *Radioactivity, *Radium, *Water pollution, *Standards, *Water pollution sources, Materials, Materials testing, *Water analysis.

This method covers the separation of dissolved radium from water for the purpose of measuring its radioactivity. While all radium isotopes are included, the method is limited to alpha-emitting radioisotopes by choice of radiation detector. The most important of these isotopes are radium-223, radium-224, and radium-226. The lower limit of concentration to which this method is applicable is 1 pCi/liter; it may be applied to higher concentration by reduction of sample size. This method may be used for absolute measurements by calibrating with a suitable alpha emitting radioisotope such as radium-226, or for relative methods by comparing measurements with each other. Mixtures of radium isotopes may be reported as equivalent radium-226. Information is also provided from which the relative contributions of radium isotopes may be calculated. (Houser-ORNL)
W72-09422

STANDARD METHOD OF TEST FOR RADIOACTIVE CESIUM IN WATER.
American Society for Testing and Materials, Philadelphia, Pa.

In: 1971 Annual Book of ASTM Standards, Part 23 - Water: Atmospheric Analyses. ASTM D-2577-69, p. 682-685.

Descriptors: *Measurement, *Radioactivity, *Cesium, *Water, *Standards, *Water Pollution, Water pollution sources, Material, Materials testing, *Water analysis.

This method covers the determination of radioactive cesium in water in concentrations greater than 1 uCi/liter. Concentration of the sample may be used in some cases to increase the sensitivity of the method. This method is not applicable to artificial brine samples containing more than two milliquivalents of sodium and free acid in the 1-ml aliquot used for extraction. The method may be used either for absolute measurements by calibrating the nuclear radiation dector with a standard cesium radioisotope of the same mass, or for relative measurements by comparing a series of measurements to each other. The method is limited to the cesium isotopes of mass 134, 136, 137, and 138. The 6-day isotope of mass 132 could interfere but would generally not be present in significant amounts in samples containing the fission product isotopes. (Houser-ORNL)
W72-09423

RADIOACTIVE FALLOUT IN AIR AND RAIN (RESULTS TO MIDDLE TO 1971),
Atomic Energy Research Establishment, Harwell (England).
R. S. Cambray, E. M. R. Fisher, W. L. Brooks, and D. H. Pierson.
Available from NTIS, Springfield, Va. as AERE-R-6923, $3.00 papercopy, $0.95 microfiche. Atomic Energy Research Establishment report no. R-6923, Nov. 1971, 53 p.

Descriptors: *Monitoring, *Nuclear explosions, *Fallout, *Precipitation (Atmospheric), *Radioactivity, *Strontium, *Cesium, Testing, Water pollution, Air pollution, Soil contamination, Sampling, Analytical techniques.
Identifiers: United Kingdom, France, China, Nuclear detonations, Military considerations, Concentration.

Samples of atmospheric dust and rainwater have been collected from the United Kingdom and elsewhere. Results are presented of analyses of these samples for various fission products and certain other radionuclides. The concentrations of the long-lived fission products in air and rain in the United Kingdom were, in the first half of 1971, similar to those for the first half of 1970. In the summer of 1971, the Chinese explosion of 14th October, 1970 contributed about 60% of the long-lived activity, which continued at about one-tenth of the levels reached in 1963-64. There has been little change in the rates of deposition of CS-137 and Sr-90 since 1966; the injection into the stratosphere of debris from Chinese nuclear explosions, in each of the years 1967-1970 inclusive has counter balanced the deposition. An estimate is made of the world-wide deposition of Sr-90 in rain to the end of 1970; the cumulative deposition has remained substantially constant since 1966. Measurements in air in the southern hemisphere show that in mid-1971, about 60% of the long-lived activity was contributed by the French tests held in the South Pacific in 1970. (Houser-ORNL)
W72-09425

ENVIRONMENTAL RADIOACTIVITY IN NEW ZEALAND. QUARTERLY REPORT, OCT.-DEC. 1970.
National Radiation Lab., Christchurch (New Zealand).

Available from NTIS as NRL-F-42; $3.00 papercopy; $0.95 microfiche. Report NRL-F-42, 1970, 16p.

Descriptors: *Air pollution, *Water pollution, *Water pollution sources, *Fallout, *Precipitation (Atmospheric), *Nuclear explosions, Testing, Evaluation.
Identifiers: Military consideration, Concentration, *France, *New Zealand.

The results of routine monitoring of fallout in New Zealand during the fourth quarter of 1970 are presented and include measurements of the total beta activity of atmosphere and rainwater samples, 90Sr content of rainwater, and the 137Cs and 90Sr contents of milk. The amount of radioactive fallout measured increased due to the 1970 French nuclear tests, but the levels of radioactivity do not constitute a public health hazard since the level measured for each location is a small fraction of permissible levels of radioactivity for continuous consumption by the general population. (Houser-DRNL)
W72-09429

RAPID METHODS FOR MEASURING RAIDOACTIVITY IN THE ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).

Available from UNIPUB, New York, N.Y. as STI/PUB/289 for $25.00. Proceedings of the International Symposium on Rapid Methods for Measurement of Radioactivity in the Environment, Neuheberg, 5-9 July 1971 CONF 710705, 967p.

Descriptors: *Monitoring, *Radioactivity, *Measurement, *Analytical techniques, *Public health, Organizations, Administrative agencies, Technical socities, Environment.
Identifiers: Rapid methods, Emergency monitoring.

The International Symposium on Rapid Methods for Measurement of Radioactivity in the Environment was held at Neuherberg near Munich, Federal Republic of Germany, from 5 to 9 July 1971. It was organized by the Government of the Federal Republic of Germany in co-operation with the Gesellschaft fur Strahlen-und Umweltforschung mbh Munchen, and with the co-sponsorship of the International Atomic Energy Agency. The Symposium was attended by about 200 participants representing nearly 30 countries and six international organizations. Apart from 12 invited papers, 43 papers were presented orally and, because of the unexpectedly large number of papers submitted, 21 were read by title only. All these papers, together with the discussions, are published in this volume. Among the topics covered in the Symposium were chemical and physical laboratory methods; field methods; normal and emergency surveillance; and data evaluation. The meeting concluded with a panel on future developments. (See W72-09438 thru W72-09457) (Houser-ORNL)
W72-09437

THE NUCLEAR POWER INDUSTRY'S NEED FOR RAPID AND ACCURATE ESTIMATION OF RADIOACTIVITY IN THE ENVIRONMENT,
National Radiological Protection Board, Harwell (England).
P. M. Bryant.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705 p 33-42 Report No. IAEA-SM-148-6).

Descriptors: *Nuclear powerplants, *Effluents, *Radioactivity, *Fallout, Water pollution, Water pollution sources, *Air contamination, *Soil contamination, Fuels, Nuclear energy, Meteorology, Public health, Food chains, Water, Milk, Dairy industry, Iodine, Environment.
Identifiers: Emergency monitoring, Nuclear fuels, United Kingdom.

The quantity and nature of postulated radioactive releases from present and future reactor types are examined. The relative significance of various routes of radiation exposure of members of the public due to these postulated releases is described. Special attention is paid to the availability and feasibility of counter measures to reduce or prevent radiation exposure of the public. Rapid and accurate analysis of radioactivity in the environment is likely to be of little more value than methods already available unless counter measures can be taken. Conversely, if counter measures are urgently required, results must be available quickly and be meaningful. The difficulties inherent in sampling and interpretation of results are discussed. Failure of a transport container involves special problems as there may be no skilled personnel in attendance and it may be difficult to get any measurement at all. The problems are examined with reference to present-day and possible future irradiation fuel transport requirements. It is concluded that there is only a limited range of counter measures for which rapid and accurate methods of measurement in the environment are likely to be justified. (See also W72-09437) (Houser - ORNL)
W72-09438

COBALT SULPHIDES, AN EFFECTIVE COLLECTOR FOR RADIO-RUTHENIUM COMPLEXES IN SEA-WATER,
Institute of Public Health, Tokyo (Japan).
N. Yamagata, and K. Iwashima.
In: Proceedings of an International Symposium held in Neuherberg, Germany, July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 85-90 (Report no. IAEA-SM-148-79).

Descriptors: *Measurement, *Ruthenium, *Radioactivity, *Cobalt, *Sulfides, *Monitoring, *Analytical techniques, Marine water, Water pollution, Water pollution sources.
Identifiers: *Concentration, *Rapid measurement, Emergency monitoring.

Collection of radioruthenium in different chemical states in sea-water has been studied for the purpose of monitoring. About 0.5 to 1.0 mg of cobalt (II) carrier was added to 100 ml of sea-water, followed by the addition of ammonium hydroxide and thioacetamide. Cobalt sulphide was precipitated homogeneously at a pH range of 9.0 to 9.5 by heating the mixture for about 1 h at 90 to 95 deg C. All the ruthenium chloro-,nitrosyl-ruthenium chloro- and nitrosylruthenium nitro-complexes were effectively recovered. The precipitate of cobalt sulphide is easily filterable and served for gamma spectrometric determination. Figures for the effect of pH and amount of cobalt on the recovery are given. (See also W72-09437) (Houser-ORNL)
W72-09439

RAPID AND SIMPLE DETERMINATION OF 59FE, 60CO, 65ZN, 137CS, AND 95ZR IN CONCENTRATED SALTS SOLUTIONS,
National Inst. of Radiological Sciences, Tokyo (Japan).
S. Kawamura, S. Shibata, and K. Kurotaki.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 119-129 (Report no. IAEA-SM-148-31).

Descriptors: *Monitoring, *Measurement, *Marine water, *Analytical technique, *Chromatography, *Ion exchange, Chemical reactions, Separation techniques, Water pollution, Water pollution sources.
Identifiers: Concentration, Elements and isotopes, Rapid method, Emergency monitoring.

An inorganic ion-exchange chromatography combined with a Ge (Li) detector to determine 59Fe, 60Co, 65Zn, 95Zr and 137Cs in sea-water rapidly is described. One litre of sea-water (with hydrochloric acid to make 0.1 M/l) spiked with 59Fe, 60Co, 65Zn, 95Zr, 137Cs, 85Sr, 106Ru and 144Ce was passed through a zirconium ferrocyanide (ZrFe) column at a flow rate of 0.2 litre/hr. ZrFe was dissolved with 60 ml of 25% EDTA 4 Na solution, followed by evaporation of the aliquot. By measuring the radioactivity of each nuclide with the Ge (Li) detector, it was found that recoveries of 95.3, 95.1, 95.4, 97.5, 94.9, 0.9, 1.8 and 2.2 were achieved for 59Fe, 60Co, 65Zn, 95Zr, 137Cs, 85Sr, 106Ru and 144Ce respectively. The method is applicable to the determination of 59Fe, 60Co, 65Zn, 95Zr and 137Cs in 1 litre of sea-water. The time for complete operation was from 7 to 8 h. When sodium zinc ferrocyanide combined with a zirconium ferrocyanide (NaZnFe ZrFe) column (100-200 mesh, 1.5 x 5 cm) was used at a low rate of 0.7 litre/h, recoveries were found to be 95.7, 95.6, 95.0, 64.1, 96.8, 0.9, 1.6 and 1.1% for 59Fe, 60Co, 65Zn, 95Zr, 137Cs, 85Sr, 106Ru and 144Ce respectively. 2.5 or 3 h is enough to complete the operation. Therefore, apart from 95Zr, the method is more rapid than the ZrFe method and recommendable for determining 59Fe, 60Co, 65Zn and 137Cs. Chemical properties, adsorption rates for radionuclides, distribution coefficients in concentrated salts solution and the ion-exchange behaviour of ZrFe are described. (See also W72-09437) (Houser-ORNL)
W72-09440

DETERMINATION OF PLUTONIUM IN ENVIRONMENTAL SURVEILLANCE SAMPLES,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).

H. Schuttelkopf.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 183-200, (Report IAEA-SM-148-61).

Descriptors: *Monitoring, *Environment, *Measurement, *Sampling, *Chemical analysis, *Plutonium, Analytical techniques, Soil analysis, Sedimentation, Water pollution, Water pollution sources.
Identifiers: Concentration, Rapid method, Emergency monitoring.

Because of the large number of samples to be investigated for 239Pu within the environmental surveillance program, a new analytical procedure was developed. It offers a considerable saving in time. About 5 1/2 h are needed for the working operation from the disintegration solution to the processed sample. Eight to ten analyses can be performed by the operator daily. The analytical procedure consists in the separation of plutonium by coprecipitation with lanthanfluoride and subsequent extraction by TTA/benzene solution. A considerable improvement in the mean error of the single results was achieved. The analytical procedure described gives a yield of about 80%, if all single steps for the samples mentioned are optimized. Interferences by the high potassium content of plant ashes and by the fairly considerable manganese content of fir needles were removed. The purification of the lanthanum carrier and the preparation and purification of 236Pu are described. The decontamination factors for polonium, radium, thorium and americium are reported. After a corresponding disintegration, the procedure can be applied to all environmental surveillance samples (vegetation, mud, plankton samples, evaporated precipitates, dust filters). (See also W72-09437) (Houser-ORNL)
W72-09441

RAPID IDENTIFICATION AND DETERMINATION OF ALPHA EMITTERS IN ENVIRONMENTAL SAMPLES,
Idaho Operations Office (AEC), Idaho Falls. Health Services Lab.
C. W. Sill, and R. L. Williams.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 201-211, (Report no. IAEA-SM-148-66).

Descriptors: *Monitoring, *Measurement, *Radioisotopes, *Spectroscopes, *Analytical techniques, Chemical analysis, Water pollution, Water pollution sources.
Identifiers: Alpha emitters, Emergency monitoring, Alpha spectrometry.

Of all radioactive nuclides, long-lived alpha emitters have the lowest permissible levels in environmental samples. Their rapid identification and determination in air dusts, smears, water and sediments are of considerable importance, particularly in emergencies, so that their impact on the public health can be assessed and remedial action begun without delay. For the immediate post-incident investigation, when time is of prime importance, direct alpha spectrometry on samples collected and counted for short periods is clearly indicated. Even though badly degraded from the absorber invariably present, alpha spectra permit positive and unequivocal identification in most cases if the intercept of the high-energy edge with the energy coordinate is used to determine the energy. Quantitative estimates can also be obtained. When chemical separations become necessary or desirable, the sample is ashed, fused with potassium fluoride and transposed to a pyrosulphate fusion. The resultant cake dissolves completely in water from which small quantities of all alpha-emitting elements from lead through californium, except astatine, radon and francium, can be precipitated simultaneously on barium sulphate. The barium sulphate is then reprecipitated from an alkaline solution of diethylenetriamine-pentaacetic acid with acetic acid leaving all alpha-emitting elements except radium in the filtrate. (See also W72-09437) (Houser-ORNL)
W72-09442

MONITORING OF TRITIUM UNDER EMERGENCY CONDITIONS,
Environmental Protection Agency, Las Vegas, Nev. Western Environmental Research Lab.
A. A. Moghissi, E. W. Bretthaur, and M. W. Carter.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 263-268, (IAEA-SM-148-7).

Descriptors: *Monitoring, *Measurement, *Tritium, *Radioactivity, *Analytical techniques, *Radiochemical analysis, Iodine, Water pollution, Water pollution sources.
Identifiers: Concentration, Emergency monitoring.

Tritium monitoring following an inadvertent release subsequent to a nuclear detonation or a reactor accident may require purification of the collected water. The method described consists of a separation of the major interfering radionuclides from the water samples by coprecipitation with silver chloride and iron-hexacyanoferrate followed by a conventional distillation. It is demonstrated that this technique effectively removes volatile radionuclides such as radioiodine. The tritium activity of the water is then determined by liquid scintillation. Several new liquid scintillation mixtures are evaluated for this purpose. In particular, the effect of naphthalene and 2,5-bis-2- (5-tert-butylbenzoxazolyl)-thiophene (BBOT) on the performance of Triton N-101-p-xylene and other mixtures has been evaluated and the results are discussed. It is recommended that all samples suspected to contain fission and activation products be subjected to the above coprecipitation. (See also W72-09437) (Houser-ORNL)
W72-09443

A SIMPLE APPLICATION OF LEAST--SQUARES FITTING TO GAMMA SPECTROMETRY OF MARINE ENVIRONMENTAL SAMPLES: THE CASE OF CESIUM RADIONUCLIDES,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
R. Fukai, S. Ballestra, and J. L. Rapaire.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 301-310, (Report no. IAEA-SM-148-17).

Descriptors: *Monitoring, *Measurement, *Instrument, *Oceans, *Saline water, *Sampling, *Cesium, Analytical techniques, Radiochemical analysis, Water pollution, Water pollution sources.
Identifiers: Gamma spectrometry, Concentration, Emergency monitoring.

A simple least-squares fitting procedure, using a small electronic computer, has been successfully applied to the problem of resolving superimposed peaks in the gamma spectra of 134Cs and 137Cs. With the aid of rapid radiochemical separation procedures, interfering radionuclides were eliminated sufficiently for accurate determination by gamma spectrometry. The procedures used and limiting conditions for the application of this technique to marine environmental samples are described and discussed in detail. With a prolonged counting time and the application of statistical smoothing technique for the recorded spectrogram the lower limit of quantitative measurements of mixtures of 134Cs and 137Cs was found to be about 1 pCi of each radionuclide with as associated error of plus or minus 20%. Instrumentation necessary to carry out the above procedure is discussed. (See also W72-09437) (Houser-ORNL)
W72-09444

RAPID DETERMINATION OF GAMMA-RAY EMITTING RADIONUCLIDES IN WATER (SCHNELLE BESTIMMUNG GAMMASTRAHLENDER RADIONUKLIDE IN WASSERN),
Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Boden-, und Lufthygiene.
J. Arndt, and R. Wolter.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 311-318 (IAEA-SM-148-78).

Descriptors: *Effluents, *Nuclear powerplants, Water pollution, *Water pollution sources, *Measurement, *Radioactivity, Environment, Public health, Nuclear meters, Computers, Computer programs, Monitoring, Assay.
Identifiers: Concentration, Gamma emitters, Rapid method, Emergency monitoring.

As part of a research program performed for the Bundesministerium fur Bildung und Wissenschaft, waste waters of four German nuclear power plants were investigated to determine their content in radioactive substances in order to obtain a balance of the different radionuclides released to the environment. Since in general these waters contained radionuclides only in small concentrations, the radioactive substances from the waste waters were enriched by sorption on the ion exchanger 'Lewasorb'. The determination of the different gamma-ray emitting radionuclides was achieved by gamma spectrometric investigations by means of a semiconductor detector and a 4000-channel analyser. With an enrichment of the radionuclides from 2 litres of water on 50 ml of 'Lewasorb', the minimum detectable activity amounts to 10 to the minus 8th power micro Ci/ml, when a detector with a sensitive volume of 28 cu cm and a counting time of 1 h is used for radionuclides, showing a transition probability of 1. The gamma spectrum obtained is registered on punched tape and evaluated by a computer. The procedure is particularly suitable as a rapid method in emergency situations and permits a complete analysis of gamma-ray emitting radionuclides within 30 min. (See also W72-09437) (Houser-ORNL)
W72-09445

RAPID EVALUATION OF RADIOACTIVE SAMPLES BY GAMMA-RAY SPECTROMETRY,
Atomic Energy Research Establishment, Harwell (England).
L. Salmon, and A. E. R. Toureau.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 339-355 (Report no. IAEA-SM-148-55).

Descriptors: *Radioactivity, *Fallout, *Precipitation (Atmospheric), *Monitoring, *Sampling, *Measurement, Tritium, Iodine, Radiochemical analysis, Environmental control, Public health, Soil contamination, Path of pollutants, Pollutant identification, Assay.
Identifiers: Gamma emitters, Tantalum, Gamma spectrometer, Emergency monitoring, Europium.

Gamma-ray spectrometry provides a convenient and relatively rapid means of performing instrumental radiochemical analysis. The technique is used regularly at Harwell to estimate hazards following any incident believed to involve the escape of radioactivity. Spectrometry may also be used for more routine monitoring of radioactivity not only in the neighborhood of nuclear establishments but of the environment in general. Various forms of gamma-ray spectrometry are described briefly with examples of applications to local environmental monitoring. Since numerical methods of analysis are used the appropriate data handling

problems are discussed. For all samples, the time and effort involved are considerably less than would be needed for traditional radiochemical analysis. (See also W72-09437) (Houser-ORNL)
W72-09446

ROLE OF LOW-BACKGROUND BETA-RAY SPECTROMETERS FOR RAPID ASSAY OF ENVIRONMENTAL SAMPLES,
National Inst. of Radiological Sciences, Chiba (Japan).
T. Maruyama, E. Tanaka, and T. Hiramato.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 357-371 (Report no. IAEA-SM-148-42).

Descriptors: *Monitoring, *Radioactivity, *Assay, *Bioassay, Water pollution, Water pollution sources, Pollutant identification, Radioisotopes, Food chains, Path of pollutants, Ecology, Measurement, Analytical techniques.
Identifiers: Beta spectrometry, Monitor background, Emergency monitoring.

The role of low-background beta-ray spectrometers ('Pico-Beta') for rapid and simple measurement of environmental radioactivity is reviewed. The detector consists of a plastic scintillation counter and window GM counter placed in the hollow of the scintillator, and the scintillation pulses coincident with the GM counter pulses are recorded by a pulse-height analyser. The pulse-height distribution is obtained in either a logarithmic or linear energy scale. The background counting rate of the spectrometer is extremely low and stable. It is possible to use this spectrometer for the following measurements: (1) low-level counting of a known nuclide; (2) identification of an unknown nuclide; (3) checking of the radiochemical purity of a sample; (4) simplification of chemical separation; (5) analysis of a mixture of radioisotopes which cannot be separated chemically; (6) determination of equilibrium ratio; (7) rapid determination of a short-lived nuclide. Radioactivity incorporated in the body may be determined by measuring the excretion rate using urine and/or blood samples, from which one may deduce the amount of activity in the body. Otherwise, in environmental measurements following a criticality accident, identification of the contamination, measurement of air-borne dust activity and analysis of the contamination of important foodstuffs such as milk, water and vegetables are of importance. (See also W72-09437) (Houser-ORNL)
W72-09447

DETERMINATION OF ENVIRONMENTAL RADIOACTIVITY BY LIQUID-SCINTILLATION SPECTROMETRY,
Research Inst. of Veterinary Medicine, Brno (Czechoslovakia).
H. Prochazka, and R. Jilek.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 373-380 (Report no. IAEA-SM-148-52).

Descriptors: *Monitoring, *Radioactivity, *Radioisotopes, *Assay, *Bioassay, Water pollution, Measurement, Biological control, Pollutant identification, Water pollution sources.
Identifiers: Concentration, Alpha spectrometry, Beta spectrometry, Emergency monitoring.

A liquid-scintillation spectrometer is used for measuring environmental radioactivity induced either by fall-out nuclides or by naturally occurring radioactive elements. The resolution of 59Fe, 60Co, 90Sr, 90Y, 103Rh, 137Cs, 147Pm, 210Po, 210Pb, 210Bi, 226Ra with its short-lived daughter products and natural uranium can be accomplished spectrometrically under the conditions described. The sensitivity of the method presented is better than 1.10-12 Ci/l per ml or g of the sample; differential relative counting efficiency for all these nuclides is better than 70% with a background 20 plus or minus 10 counts/min. An example of qualitative and quantitative determination of the nuclides examined is presented together with basic mathematical principles of their calculation. The rapid method described is suitable for measuring radioactive contaminated waters as well as biological samples. The total activity of every complex or element can easily be calculated from the calibration curve constructed by measuring a descending series of standard samples. This method is well suited to one-labelled samples and for mixed samples of known composition. (See also W72-09437) (Houser-ORNL)
W72-09448

APPLICATION OF LIQUID SCINTILLATION SPECTROMETRY FOR TOTAL BETA AND ALPHA ASSAY,
New York Operations Office (AEC), N.Y. Health and Safety Lab.
D. C. Bogen, and G. A. Welford.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 383-389 (Report no. IAEA-SM-148-3).

Descriptors: *Monitoring, *Environment, *Measurement, *Assay, Water pollution, Water pollution sources, *Pollutant identification, Radioactivity, Radioisotopes, Fallout, Tritium, *Spectrometry.
Identifiers: Concentration, *Beta spectrometry, *Alpha spectrometry, Emergency monitoring.

Total beta and alpha measurements have been performed, simultaneously, by liquid scintillation spectrometry. The beta measurement classifies the isotopes by energy discrimination into two categories: low energy (3H, etc.) and fission products or activation products of medium-to-high energy. The alpha measurement is performed by ratio techniques since the alpha spectrum is located in the medium to high energy beta spectral region. Therefore, one measurement provides the following information for an environmental sample: (1) relative contribution of tritium and other low energy emitters to the total beta spectrum: (2) contribution of fission and activation products to the total beta spectrum: and (3) total alpha activity. The approximate detection limits would be 0.6 dpm/ml for low energy beta, 0.3 dpm/ml for high energy beta and 0.1 dpm/ml for alpha. A one sigma background error as the limit, a 100-min counting time, a 3-ml sample volume and an alpha content of 10% of the total sample activity were assumed. A description of experimental results, data processing, application to environmental monitoring and comparison of this technique to existing methods are given. Comparative results for synthetic and environmental water samples counted by conventional and liquid scintillation techniques agree within 20% for different mixtures of alpha and beta. Comparative results for residue and swipe samples agree within 25%. (See also W72-09437) (Houser-ORNL)
W72-09449

MEASUREMENTS OF 89SR AND 90SR IN ENVIRONMENTAL SAMPLES BY A LOW--BACKGROUND BETA-RAY SPECTROMETER,
National Institute of Radiological Sciences, Chiba (Japan).
H. Kamada, M. Mita, and M. Saiki.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 427-439 (Report no. IAEA-SM-148-29).

Descriptors: *Monitoring, *Radioactivity, *Radioisotopes, *Strontium sampling, Measurement, Analytical techniques, Assay, Mathematical studies, *Spectrometers.
Identifiers: *Beta spectrometry, Emergency monitoring, Concentration.

The direct quantitative analysis of 89Sr and 90Sr has been successfully carried out by low-background beta-ray spectrometry. According to this method the 90Y milking operation which requires storage of SrCO3 for two weeks after chemical separation from samples, could be omitted. Therefore, many samples could be analysed more easily and quickly. An attempt to apply beta-ray spectrometry to the survey of the fall-out level radioactivity was made. The individual radioactivities of 89Sr, 90Sr, and 90Y in the sample were calculated by the simultaneous equation method taking into consideration interference factors which express the fractional contribution of the selected regions of beta-ray spectra due to 89Sr, 90Sr, and 90Y. The amount of the individual nuclide on the composite 90Sr + 90Y + 89Sr spectra, obtained by this method, agreed well with standard values. Errors from self-absorption were also corrected. The concentration of 90Sr in soil samples determined by this method agreed well with conventional method results obtained by this and other laboratories. The data on various kinds of environmental samples determined by this method showed a detectable amount of 89Sr. The operation of chemical separation could be shortened by this method, and 89Sr and 90Sr in many environmental monitoring samples could be determined more easily and more accurately in a shorter time. (See also W72-09437) (Houser-ORNL)
W72-09450

A QUICK AND CONVENIENT MEASUREMENT METHOD FOR SURFACE AND LIQUID CONTAMINATION USING THE TLD SYSTEM,
Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Institut fuer Strahlenschutz.
K. Naba, A. Hefner, and C. Tritremmel.
In: Proceedings on an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 549-563 (Report no. IAEA-SM-148-69).

Descriptors: *Monitoring, *Environment, *Radioactivity, Water pollution, Water pollution sources, *Nuclear explosions, Soil contamination, Fallout, Food chains, Public health, Measurement, Instrumentation.
Identifiers: Emergency monitoring, Environmental monitoring, Concentration, *TLD system.

At the present time and in the near future, underground nuclear explosions will often be used for peaceful uses and sometimes accidental radioactive contamination may occur in the area surrounding an atomic power plant. These contaminations will be spread over a wide area and occur under different environmental conditions. In considering the measurement of contamination, TLD is believed to be a quick method in this connection. ATL material, LiF: Mg, from a new starting material, named NTL-35, 50 series was developed for measuring contamination quickly in the field. The following properties of NTL-50 make it suitable for field measurements: (1) usable without annealing before irradiation; (2) change in response during irradiation below 40 deg C; (3) no fading after exposure below 40 deg C; (4) sensitivity linear from 1 mR to 104 R; (5) sensitivity for beta radiation and small energy dependence for low-energy photons; (6) low cost. Some experimental measurements were made using TLD simulating surface and water contamination with several kinds of beta or gamma emitters, for example 147Pm, 90Sr-90Y, 137Cs, 60Co, and the levels of surface contamination were from 10-4 micro Ci/cm2 to 10-2 micro Ci/cm2. Water contamination with the same nuclides at several concentrations was also investigated. As a result, NTL-50 from TL material seems to be a suitable method for quickly measuring surface contamination in the field but some problems which arise from the ef-

fect of sunlight and the beta sensitivity upon TL material have not yet been solved. This quick method of using TLD may also have applications for monitoring in a radiation control area. (See also W72-09437) (Houser-ORNL)
W72-09451

ENVIRONMENTAL MONITORING SYSTEM FOR NUCLEAR TESTS,
Environmental Protection Agency, Las Vegas, Nev. Western Environmental Research Lab.
M. W. Carter, D. T. Wruble, and R. E. Jaquish.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 575-586 (Report no. IAEA-SM-148-9).

Descriptors: *Monitoring, *Environment, *Measurement, *Instrumentation, *Nuclear explosions, *Fallout, *Soil contamination, *Water pollution, Air pollution, Water pollution sources, Radioactivity, Radio communication systems, Sampling, Analytical techniques, Assay, Evaluation, Pollutant identification, Data collections, Data processing, Data transmission, Network, Public health.
Identifiers: Emergency monitoring, Monitoring system, Aircraft survey, Concentration.

The extensive environmental monitoring system maintained by the Western Environmental Research Laboratory for nuclear testing programs in the United States of America is designed to produce comprehensive information and data on radioactive contamination and exposures as quickly as possible. This is accomplished through use of aircraft and mobile ground monitoring teams that can make radiation measurements and collect a variety of environmental samples, followed by specially designed laboratory analytical procedures and data processing to expedite data acquisition. The system can thereby provide rapid assessment of radioactive releases that may affect a large segment of the population within the western United States. The information is then used to evaluate both short-term and long-term environmental and public health implications of the releases. Pertinent information and data are made available to various official state and other agencies, and provisions are made to effect protective measures if these should be deemed necessary or desirable. (See also W72-09437) (Houser-ORNL)
W72-09452

SAMPLING AND ANALYTICAL SYSTEMS FOR MEASURING ENVIRONMENTAL RADIOACTIVITY,
California Univ., Livermore. Lawrence Radiation Lab.
J. J. Koranda, P. L. Phelps, L. A. Anspaugh, and G. Holladay.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 587-614 (Report IAEA-SM-148-36).

Descriptors: *Monitoring, *Environment, *Effluents, *Nuclear powerplants, *Nuclear explosions, Fallout, Sampling, Analytical techniques, Assay, Instrumentation, Tritium, Vegetation, Water pollution, Food chains, Public health, Soil contamination, Animal populations, Ecology, Air pollution.
Identifiers: Emergency monitoring.

Rapid methods of sampling and quantitating airborne tritiated water, radioactive particulates and a wide range of environmental samples have been developed to document the releases of radioactivity associated with uses of nuclear explosives, reactor operation and basic radioecological studies. Two types of atmospheric water samplers have been used in environmental studies conducted in remote field operations. A simple cold-pipe sampler of several designs employing either LN or CO2 has been used in laboratory studies and field studies. A more complex sampler which may eventually be actuated using a column of magnesium perchlorate or molecular sieve has also been used. A sampling and analytical system for determining air concentrations of radioactive particulates has been used successfully in several types of radioecological studies associated with nuclear cratering experiments, monitoring of worldwide and close-in fall-out deposition, and reactor studies. A series of automatically sequenced air pumps which draw air through an efficient fibreglass filter is the basic component of this flexible air sampling system. The system may be turned on by radiation levels or by other means. The sample is assayed with a solid-state detector and a 4096-channel pulse height analyser. The high resolution of this spectrometer permits quantitating 10-20 radionuclides simultaneously. Sample preparation techniques for a wide range of environmental samples including animal organs, vegetation, and soil are discussed. (See also W72-09437) (Houser-ORNL)
W72-09453

AUTOMATIC MONITORING METHOD USING BIOLOGICAL CONCENTRATION FOR MARINE RADIOACTIVE CONTAMINATION,
Tokyo Univ. (Japan). Fisheries Inst.
Y. Hiyama, M. Shimizu, R. Kuwabara, and T. Yamamoto.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 627-634 (Report No. IAEA-SM-148-24).

Descriptors: *Monitoring, *Aquatic life, *Marine animals, *Marine biology, *Environmental effects, Ecosystem, Ecology, Absorption, Marine plants, Measurement, Regulation, Food chains, Public health, Japan.
Identifiers: Biological control, Emergency monitoring, Automatic monitoring, Concentration.

For the continuous automatic monitoring of radioactivity in coastal water, a scintillation counter in a waterproof container dipped in water is a possible method. A new and efficient device with a crown or cap containing certain organisms at the top of the waterproof counter head has some advantages, and is described. Some experiments with mussels and algae are reported; further investigations with other organisms and non-biological material, such as ion-exchange resin, are being undertaken. (See also W72-09437) (Houser-ORNL)
W72-09454

RADIOACTIVE AND METALLIC (COPPER AND ZINC) POLLUTANTS IN THE SCHELDT ESTUARY (IN WATER, SEDIMENT AND SUSPENDED MATTER), (LES POLLUANTS RADIOACTIFS ET METALLIQUES (CUIVRE ET ZINC) DANS L'ESTUAIRE DE L'ESCAUT (EAUX, SEDIMENTS ET MATIERES EN SUSPENSION)),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
E. Peeters.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 635-647 (Report No. IAEA-SM-148-21).

Descriptors: *Monitoring, Domestic water, Surface water, Oceans, Sea water, *Radioactivity, *Measurement, Radioactivity effects, Ecology, Radioisotopes, *Copper, *Zinc, Mercury, Lead, Sediments.
Identifiers: Emergency monitoring, Concentration, Gamma spectrometry, *Scheldt estuary.

As part of a study of fresh-water and sea-water pollutants and their influence on the ecology of the Belgian coast, the Laboratoire d'oceanographie physique (Physical Oceanography Laboratory) of the Institut royal des sciences naturelles de Belgique (Belgian Royal Institute of Natural Sciences) has embarked upon a general investigation of the various radioactive and metallic pollutants present in sediment, water and suspended matter in the North Sea and the Scheldt Estuary. All the radioactive pollutants in a given part of the Scheldt are being subjected to a thorough study. The metallic pollutants include copper and zinc, for which a fast determination method is being developed. The radionuclides are being determined by high-resolution gamma spectrometry, and copper and zinc by atomic absorption spectrophotometry. A similar method is to be employed later for determining mercury and lead in the same matrices. Figures are given for the concentration of the various metals and radioisotopes of concern. (See also W72-09437) (Houser-ORNL)
W72-09455

RAPID METHODS FOR RADIOACTIVE ENVIRONMENTAL MONITORING IN THE FEDERAL REPUBLIC OF GERMANY, (SCHNELLMETHODEN ZUR UBERWACHUNG DER RADIOAKTIVITAT IN DER BUNDESREPUBLIK DEUTSCHLAND),
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany).
B. Sansoni.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 655-675 (Report No. IAEA-SM-148-56).

Descriptors: *Monitoring, *Measurement, *Fallout, *Public health, *Dairy industry, *Milk, *Food chains, Analytical techniques, Strontium, Cesium, Germany.
Identifiers: Concentration, Spectrometry (Gamma), *Germany.

In the State Committee for Atomic Energy of the Federal Republic of Germany the subcommittee for radioactive monitoring of food and other biological materials established in 1966 a working group on rapid methods. It had the duty of assisting the stations in the radioactivity surveillance network to extend fall-out analysis to emergency situations, to study the basic considerations for the use of rapid methods in such situations, to stimulate the development of new rapid methods in this field and to evaluate them by intercomparison runs between different laboratories. (See also W72-09437) (Houser-ORNL)
W72-09456

RAPID METHODS FOR SPECIFIC RADIONUCLIDE ANALYSIS AND THEIR APPLICATION TO AQUATIC EMERGENCY CONDITIONS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. W. R. Dutton, and N. T. Mitchell.
In: Proceedings of an International Symposium held in Neuherberg July 5-9, 1971, 'Rapid Methods for Measuring Radioactivity in the Environment.' Conference 710705, p 745-755 (Report No. IAEA-SM-148-13).

Descriptors: *Monitoring, *Aquatic life, Water pollution, Water pollution sources, *Radioactive wastes, *Nuclear wastes, *Analytical techniques, Public health, Effluents, Path of pollutants, Accidents, Hazards, Toxicity, Pollutant identification, Assay.
Identifiers: Emergency monitoring, Concentration, Rapid methods.

The responsibilities of the Fisheries Radiobiological Laboratory, Lowestoft, include monitoring of the aquatic environment as part of the control system to ensure safe disposal of liquid radioactive waste. In addition to planned discharges this responsibility extends to surveillance of the con-

sequences to the aquatic environment of nuclear accidents. Laboratory methods of analysis for routine disposals have been developed and many of these can be adapted for use in emergency conditions. Some methods are already rapid; others are readily amenable to modification so that a result is produced quickly, in an hour or so or even less. A range of laboratory analytical methods in current use for controlled disposals is described, together with an account of procedures at successive stages of sample preparation, chemical separation (where necessary), radiometric measurement and processing of data. They include both manual and automated procedures, using a range of detector systems, and are directed to estimation of specific radionuclides. An account is given of how these methods would be applied in the event of an emergency, and integrated with field measurement techniques. The way in which they would be adapted to overcome limitations imposed by their operation outside controlled laboratory conditions and avoidance of any large amount of costly equipment held in readiness but idle most of its life is discussed. (See also W72-09437) (Houser-ORNL)
W72-09457

SYSTEM FOR MEASURING ORGANIC CONTENT OF WATER,
Envirotech Corp., Palo Alto, Calif. (Assignee).
For primary bibliographic entry see Field 05D.
W72-09493

TROPOSPHERIC SCAVENGING OF 90SR AND 3H,
New York Operations Office (AEC), N. Y. Health and Safety Div.
P. W. Krey, and B. Krajewski.
Available from NTIS as part of Conf. No. 700601, $6.00 in paper copy, $0.95 microfiche. In: Proceedings of Symposium held at Richland, Wash., June 2-4, 1970, Conf. No. 700601, AEC Symposium Series-22, p 447-463.

Descriptors: *Monitoring, *Strontium, *Tritium, *Atmosphere, *Measurement, Nuclear explosions, Fallout, Radioactivity, Particle size, Water vapor, Model studies, Ion transport, Precipitation (Atmospheric), Oceans.
Identifiers: Half residence time, *Troposphere.

HTO inventories of the troposphere can be computed from the data of a worldwide precipitation-collection network. The half residence times of 90Sr and tritium injected from the stratosphere into the troposphere were calculated. These values differ because 90Sr is associated with particulate debris but tritium is in the vapor phase and has a second removal pathway by vapor exchange with the oceans. Tropospheric inventories of tritium as HTO are calculated for the years 1963, 1964, and 1965 with data from the precipitation network of the International Atomic Energy Agency. From these inventories, from 90Sr surface-air measurements, and from simple models of atmospheric transport, the half residence time of nuclear weapon particulate debris and the HTO tritium of recent stratospheric origin were computed. The previously reported half residence time of 30 days for 90Sr was verified, and a surprisingly low overall half residence time of 10 days was found for HTO. This overall 10-day value is the result of tritium removal by precipitation and by vapor exchange with the oceans. The half residence time for HTO removed by precipitation is 28 days but only 16 days by vapor exchange. (Houser-ORNL)
W72-09528

SELF-DIFFUSION OF TRACE CONCENTRATIONS OF CE-144, PM-147, AND EU-155 IN WATER SOLUTIONS,
Ceskoslovenska Akademie Ved, Prague. Ustav Jaderneho Vyzkumu.
For primary bibliographic entry see Field 05B.
W72-09530

DISTRIBUTION OF CESIUM-137 AND NATURALLY OCCURRING RADIONUCLIDES IN SEDIMENTS OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 05B.
W72-09532

RADIOACTIVITY LEVELS IN SELECTED OHIO STREAMS; THE GREAT MIAMI RIVER, THE LITTLE MIAMI RIVER, AND MILL CREEK; JUNE-AUG. 1968.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Programs.
For primary bibliographic entry see Field 05B.
W72-09533

OCCURRENCE AND DISTRIBUTION OF TRACE ELEMENTS IN NEW JERSEY STREAMS,
Geological Survey, Trenton, N.J.
P. W. Anderson.
New Jersey Division of Water Policy and Supply, Water Resources Circular No 24, 1970. 24 p, 1 fig, 3 tab, 7 ref.

Descriptors: *Trace elements, *Streams, *New Jersey, *Chemical analysis, *Water analysis, Water quality, Water chemistry, Water properties, Data collections, Freshwater, Sampling, Laboratory tests, Water pollution sources, Pollutant identification.

The concentration of trace elements was measured in water samples collected at 37 stream-sampling sites in New Jersey. Higher than normal concentrations were found in some streams where water quality was influenced by the discharge of industrial and municipal waste waters. However, high concentrations of iron and manganese relate better to vegetal decomposition or to groundwater inflow to streams. In general, the magnitude of concentration of the individual elements, in descending order, was iron, aluminum, strontium, manganese, boron, barius, chromium, copper, nickel, zinc, lead, cobalt, lithium, titanium, rubidium, vanadium, molybdenum, and silver. The analytical values for these elements are tabulated. No detectable concentrations of beryllium, bismuth, cadmium, germanium, and tin were found. (Woodard-USGS)
W72-09545

SALINITY, RUNOFF AND WIND MEASUREMENTS, YAQUINA ESTUARY, OREGON,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W72-09554

SOME SEPARATION CHARACTERISTICS OF AN OV-101/OV-210 COLUMN FOR ORGANOCHLORINATED PESTICIDES WITH PARTICULAR REFERENCE TO THE SEPARATION OF PHOTOENDRIN AND ENDRIN,
Department of the Environment, Ottawa (Ontario). Water Quality Div.
A. S. Y. Chau, and R. J. Wilkinson.
Bulletin of Environmental Contamination and Toxicology, Vol. 7, No. 2/3, p 93-104, February/March 1972. 8 fig, 9 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Separation techniques, *Endrin, *Gas chromatography, Aldrin, DDE, Dieldrin, DDT, DDD, Heptachlor, *Pesticides, Pollutant identification, Organic pesticides, Alcohols, Laboratory equipment, Analytical techniques.
Identifiers: *Isomers, *Electron capture gas chromatography, *Metabolites, *OV-silicone columns, *Photoendrin, Photoisomers, Methoxychlor, Chlordane, Endosulfan, Lindane, Heptachlor epoxide, Hydroxychlorodene, *Column chromatography, Detection limits, o p' DDT, p p' DDD.

The mixed OV-silicone column (OV-101/OV-210) was found to be capable of separating endrin and photoendrin without preconditioning for endrin. The mixed column consisted of 3.6 percent OV-101 and 5.5 percent OV-210 on Chromosorb W, 80-100 mesh, AW, DMCS treated and conditioned at 250 degrees C for 78 hours before use. The column has several characteristics which complement those of the DC-11/QF-1 column. The OV-silicone column does not thermally isomerize endrin to the extent of many columns, e.g., DC-11/QF-1 and SE-30. With a normal injection concentration of 100-1000 pg, the chromatograms of endrin display one single sharp peak; therefore, the detection limit for endrin is lowered with the mixed column. The OV-silicone column has good separation properties for the routine analysis of other organochlorinated pesticides such as dieldrin, o,p'-DDT, p,p'-DDD, and beta-endosulfan. One of the column's most desirable characteristics is its increased sensitivity to 1-hydroxychlordene (a product of heptachlor hydrolysis), and 1-hydroxy-3- chlorochlordene. The OV-silicone column gave sharp peaks to polar compounds such as hydroxyl compounds: dicofol, cis-9 and trans-aldrin diols. It appears that this column is ideal for oxygen analogs of organophosphates. (Holoman-Battelle)
W72-09561

METHYLATION OF PENTACHLOROPHENOL BY TRICHODERMA VIRGATUM,
Western Forest Products Lab., Vancouver (British Columbia).
For primary bibliographic entry see Field 05B.
W72-09562

DISPLACEMENT CHROMATOGRAPHY OF HYDROCARBONS,
Esso Research Centre, Abingdon (England).
S. G. Perry.
Journal of the Institute of Petroleum, Vol. 58, No. 559, p 47-51, January 1972. 2 fig, 9 tab, 3 ref.

Descriptors: *Chromatography, Pressure, Gels, Fluorescence, *Organic compounds, Gasoline, Fuels, Hydrogen ion concentration, *Aromatic compounds, Separation techniques, Pressure head, Columns, Pollutant identification, Adsorption, Silica, Measurement, Chemical analysis, Physical properties, Alcohols, Laboratory equipment.
Identifiers: *Fluorescent indicator adsorption, Naphtha, Jet fuel, Liquid displacement chromatography, Inter-zone resolution, Paraffins, Naphthenes, Isopropanol, Silica gel, Method evaluation.

The aim was to achieve and evaluate the acceleration of FIA (fluorescent indicator adsorption) methods by increasing pressure from normal 1-5 psig in order to decrease analysis time and to establish whether it is necessary to decrease adsorbent particle size and size range to preserve inter-zone resolution. Pumps were found to be more convenient for pressurizing columns than gas cylinders, and pressures of 20-35 psig yielded analysis times in the 5-10 min range with good accuracy. Tests revealed that there was no advantage in using finer grades of gels in the columns and that a pH of 4 is best for hydrocarbon type analysis. Injection tests showed that the best injection site for rapid FIA was at the neck below the charger section of the standard FIA tube. Precision and reproducibility of the rapid method were determined by 20 analyses of naphtha and proved more than adequate. Brief consideration was given to extending the technique to higher boiling fractions (above 315 C end point) and to recovery of representative saturate fractions. (Mackan-Battelle)
W72-09563

EXPERIMENTAL STUDY OF THE FOULING PROCESS AT SEA,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
M. A. Dolgopol'skaya.

Available from the National Technical Information Service as AD-713 796, $3.00 in paper copy, $0.95 in microfiche. Naval Intelligence Command Translation No. 3088 (b), October 28, 1970. 22 p, 9 tab, 38 ref.

Descriptors: *Sea water, *Fouling, *Biomass, Seasonal, Larvae, Mussels, Benthic fauna, Protozoa, Oysters, Worms, Rotifers, Diatoms, *Growth rates, Migration, *Benthos, Biological communities, Systematics, Microscopy, Plant morphology, Plankton, *Sampling, Crustaceans, Annelids, Periphyton.
Identifiers: Barnacles, Balanus improvisus, Balanus eburneus, *Black Sea, *Sebastopol Gulf, Polychaetes, Bryozoa, Nauplii, Cyphonautes, Membranipora, Botryllids, Pomatoceros triqueter, Spirorbis, Nemerteans, Turbellaria, Leptoplana, Vorticella, Suctorians, Infusorians, Lepralia, Balanus balanoides.

The fouling process in seawater was studied by suspending panels at one-month intervals to determine qualitative composition, number of settling organisms, growth rates, and total weight for each month. Another group of 12 panels was suspended from which one panel was removed each month and examined and replaced by a fresh panel. This allowed a study of fouling as a function of the time during which the panel was suspended and as a function of the month in which fouling began. Both glass and iron panels were used. Experiments were conducted in the Sebastopol Gulf of the Black Sea. The number of individual organisms varied from 0 to 224.800 specimens per square meter for barnacles and from 0 to 6,000 for mussels. The total weight of organisms settling during a month varied from less than 1 gram per square meter in winter to 548 grams in autumn. The total weight of fouling of panels suspended for a year varied with the month in which fouling began. Settlement on the panels began with a complex of organisms whose larvae were found in the plankton at that time. Larvae were found to settle more freely on a clean surface than on one already occupied by other organisms. Fouling by barnacles was greatest on under surfaces. (Mortland-Battelle)
W72-09564

GAS-SOLID CHROMATOGRAPHY OF ORGANIC COMPOUNDS USING STEAM AS THE CARRIER GAS,
Tokyo Univ. of Education (Japan). Inst. for Optical Research.
A. Nonaka.
Analytical Chemistry, Vol. 44, No. 2, p 271-276, February 1972. 10 fig, 4 tab, 22 ref.

Descriptors: *Organic compounds, *Steam, *Alcohols, Adsorption, Carriers, Phenols, Potassium compounds, *Organic acids, Laboratory equipment, Chemical analysis, Oil, *Chromatography.
Identifiers: *Gas solid chromatography, *Amines, Steam solid chromatography, Column packing, Fatty acids, Ketones, Esters, Aldehydes, Stearic acid, Potassium palmitate, Chromatograms, Boiling point, Butanol, Ethanol, Hexanol, Propanol, Methanol, Cyclohexanol, Diacetone alcohol, Benzyl alcohol, Pentanol, Pentane, Hexane, Heptane, Benzene, Octane, Toluene, Nonane, Xylene, Naphthalene, Anthracene, Chrysene, Triphenylene, Biphenyls, Terphenyls, Quaterphenyls, Benzoic acid, Salicyclic acid, Lactic acid, Carbon tetrachloride, Lautric acid, Palmitic acid, Myristic acid, Potassium laurate, Potassium myristate, Potassium stearate, 2,4-dimethylphenol, Ethylphenol, Butylphenol, Acetic acid, Propionic acid, Caproic acid, Enanthic acid, Malonic acid, Succinic acid, Adipic acid, Pyridine, Analine, Toluidine.

Mixtures of hydrocarbons, alcohols, organic acids, amines, and other organic compounds can be separated without any marked tailing by using steam as the carrier gas for gas-solid chromatography. Activated alumina serves as a good adsorbent for low-boiling hydrocarbons, Chromosorb P for high-boiling hydrocarbons, diatomaceous firebrick powder modified by hydrofluoric acid for alcohols, ketones, and esters, diatomaceous firebrick powder containing little phosphoric acid for carboxylic acids and phenols, and sintered magnesia for amines. Use of steam as carrier gas may considerably extend the applicability of gas-solid chromatography. High-boiling materials, in general, can be eluted rather fast with steam. Water-containing samples can also be subjected to the analysis without any difficulty. For example, even the separation of 0.1 ppm C2-C7 fatty acids in aqueous solution can be achieved in this way. (Mackan-Battelle)
W72-09566

EMERGENCE TRAP COLLECTIONS OF TRICHOPTERA FROM AN OREGON STREAM,
Oregon State Univ., Corvallis. Dept. of Entomology.
N. H. Anderson, and J. L. Wold.
The Canadian Entomologist, Vol. 104, No. 2, p 189-201, February 1972. 4 fig, 16 ref.

Descriptors: *Sampling, *Caddisflies, *Distribution patterns, *Systematics, Aquatic insects, Equipment, Streams, *Oregon, Growth stages, Benthic fauna, Seasonal, Ecological distribution.
Identifiers: *Emergence traps, *Oak Creek (Ore), Sex ratios, Species abundance, Rhyacophila ecosa, Rhyacophila fenderi, Rhyacophila grandis, Rhyacophila iranda, Rhyacophila narvae, Rhyacophila pellisa, Rhyacophila vao, Rhyacophila vaccua, Rhyacophila vedra, Rhyacophila vuzana, Rhyacophila willametta, Glossosoma penitum, Anagapetus bernea, Agapetus bifidus, Dolophilodes dorcus, Wormaldia anilla, Wormaldia gabriella.

Thirty-nine species of adult caddisflies (Trichoptera) representing 11 families were collected from emergence traps set at four selected sampling sites in Oak Creek (Oregon) between May 1968 and December 1970. The tent-shaped emergence traps (meter squared base; 2 m high) were covered with fiberglass window screen and equipped with a door on one side to allow entry of insects. Bottom flaps of screening allowed water to flow under the trap, and the top of each trap was covered with a strip of plastic to provide shelter during rain. All traps were placed in riffle areas where the substrate was gravel and small rubble. The insects were collected twice a week during major emergence periods and weekly, except during extreme weather, the remainder of the year. Glossosomatidae and Limnephilidae were the most abundant families, but Rhyacophilidae was represented by the most species. The relative abundance, seasonal occurrence, sex ratios, and ecological segregation of related species are discussed. (Holoman-Battelle)
W72-09571

CAPE COD BAY ECOSYSTEM QUANTITATIVE ANALYSIS,
Marine Biological Lab., Woods Hole, Mass. Systematics-Ecology Program.
For primary bibliographic entry see Field 02L.
W72-09573

THE DISTRIBUTION OF CESIUM, RUBIDIUM, AND POTASSIUM IN THE QUASI-MARINE ECOSYSTEM OF THE SALTON SEA,
California Univ., San Diego.
For primary bibliographic entry see Field 05B.
W72-09574

BIOLUMINESCENCE AND PRIMARY PRODUCTIVITY IN MARINE ESTUARINE ENVIRONMENTS,
Johns Hopkins University, Baltimore, Md. McCollum-Pratt Inst.
For primary bibliographic entry see Field 05C.
W72-09575

TRACE ELEMENT CONCENTRATIONS IN SOME MODERN CORALS,
Woods Hole Oceanographic Institution, Mass.
H. D. Livingston, and G. Thompson.
Limnology and Oceanography, Vol. 16, No. 5, p 786-796, September 1971. 3 tab, 35 ref.

Descriptors: *Heavy metals, *Trace elements, *Neutron activation analysis, *Coral, Detritus, Sampling, Geochemistry, X-ray diffraction, Absorption, Distribution patterns, Strontium, Copper, Zinc, Calcium, Sea water, Metabolism, Calcite, Iron, Estuarine environment, Manganese, Cobalt, Nickel, Lead, Titanium, Chromium, Boron.
Identifiers: Skeletogenesis, Aragonite, Gamma spectrometry, Optical emission spectrometry, Uranium, Barium, Lithium, *Ahermatypic, *Hermatypic, *Discovery Bay, *Jamaica, Silicon, Acetic acid, Scandium, Sample preparation, Solenosmilia variabilis, Desmophyllum cristogalli, Caryophyllia clavus, Caryophyllia communis, Trochocyathus, Dendrophyllia, Madracis asperula, Cladocora patriarca, Anomocora cf Anomocora fecunda, Bathycyathus maculatus, Meandrina areolata, Meandrina braziliensis, Madracis sp cf Madracis pharensis, Porites porites, Madracis mirabilis, Montastrea annularis, Scolmia cubensis, Phyllangia americana.

Samples of hermatypic and ahermatypic varieties of scleractinian coral were collected from various ocean locations and prepared for analysis of trace elements by crushing, ultrasonic cleaning, and drying at 90 C. A portion of each sample was dissolved in 4 percent acetic acid. The soluble and insoluble portions were analyzed by gamma spectrometry after neutron activation or by optical emission spectrometry, from which data the distribution of trace elements between the coral skeleton and the detrital phases could be inferred. There was generally good agreement between the data from the two techniques, with the greatest discrepancy occurring with iron. Sr, U, Ba, Cu, B, Li, and Zn were generally present in the corl skeleton. Species were found which discriminate against Sr, U, B, Li, or Zn. Si, Ti, and Cr were generally present in detrital phases; the nature of the detritus often reflected the local environment. Fe, Mn, Co, Ni, Pb and Se were variously distributed between both parts of the coral. (Synder-Battelle)
W72-09577

NITROGEN FIXATION BY BACTERIA IN LAKE MIZE, FLORIDA, AND IN SOME LACUSTRINE SEDIMENTS,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05C.
W72-09579

ENERGETICS OF NATURAL POPULATIONS OF FRESHWATER MACROCONSUMERS,
Michigan State Univ. Hickory Corners. W.K. Kellogg Biological Station.
For primary bibliographic entry see Field 05C.
W72-09666

THE RATE OF LOSS OF MERCURY BY PACIFIC OYSTERS,
Washington Univ., Seattle. Lab. of Radiation Ecology.
A. H. Seymour.
Available from the National Technical Information Service as RLO-2225-T-I-6, $3.00 in paper copy, $0.95 in microfiche. Report No. RLO-2225-TI-6, February 25, 1971. 10 p, 2 fig, 3 tab, CONF-710215-1.

Descriptors: *Oysters, *Absorption, Radioisotopes, Sea water, Laboratory equipment, Shellfish, Aquatic animals, Bioassay, Metabolism, Heavy metals, Macroinvertebrates, Radioactivity techniques, *Mercury.

Identifiers: *Mercury radioisotopes, Crassostrea gigas, Crassostrea, Biological loss, Radioactive decay, Mercuryr203.

A radioisotope of mercury, mercury-203, with a 47-day half-life was used to estimate the rate of loss of mercury by individual oysters. After the oysters, Crassostrea gigas, had accumulated Hg-203 as HgC12 directly from seawater in a laboratory aquarium, they were transferred to fresh seawater in other laboratory aquariums for nine days and then returned to their natural bed. Measurements of Hg-203 in the oysters were made daily for the first nine days and at fortnightly intervals thereafter from March to July, 1970. The rates of loss of Hg-203 were approximately exponential for four periods - days 1 to 2, 2 to 9, 9 to 32, and 32 to 133. The average values for the total rate of loss by both radiological decay and biological turnover were estimated for the four periods, and from these estimates the biological half-life values were calculated. For the four periods the biological half-life values, which are assumed to be the same for Hg-203 as for all other isotopes of mercury, were 4.9, 9.8, 21 and 44 days, respectively. (Jefferis-Battelle)
W72-09667

UNDERSTANDING TURBIDITY MEASUREMENT,
Hach Chemical Co., Ames, Iowa.
For primary bibliographic entry see Field 05F.
W72-09671

GETTING REPRESENTATIVE WATER SAMPLES,
Raytheon Co., Lexington, Mass. Environmental Systems Center.
P. McNelis.
Industrial Water Engineering, Vol. 9, No. 2, p 23-24, February/March 1972. 2 fig.

Descriptors: *Sampling, *Effluents, *Water quality, Analytical techniques, Monitoring, Colorimetry, Hydrogen ion concentration, Conductivity, Water temperature, Turbidity, Fluorides, Chlorides, Chromium, Phosphates, Ammonia, Copper, Iron, Instrumentation, Dissolved oxygen, Water analysis.
Identifiers: Grab sampling, Composite sampling, Continuous sampling, Sample preservation, Sensors, Sample preparation, Orthophosphates.

There are three general approaches to obtaining a representative sample for water quality analysis: grab sampling, composite sampling, and continuous sample flow conditions. Grab samples consist of a prescribed volume taken at a particular point in time and space. Depending on the intended analysis, a fixing operation may be required immediately after the sample is taken. Grab sampling is used when flow is not continuous, when discharge characteristics change rapidly, or when a composite sample may be camouflaging extreme conditions. A composite sample is a mixture of many small samples taken at frequent intervals, either in time or space. Sample fixing may also be necessary. Continuous monitoring utilizes fixed sensors and can respond to real-time changes in stream or process conditions. Sensors can provide continuous readings on water quality parameters such as pH, DO, conductivity, temperature, turbidity, fluoride, chloride, etc. However, colorimetric analysis is necessary for parameters such as chromium, orthophosphate, ammonia, copper, and iron, and pretreatment assemblies usually precede these units. (Mortland-Battelle)
W72-09672

POLAROGRAPHY OF SEAWATER II. COMPLEX FORMATION OF CADMIUM WITH EDTA,
Zagreb Univ. (Yugoslavia). Center for Marine Research.
D. Maljkovic, and M. Branica.
Limnology and Oceanography, Vol. 16, No. 5, p. 779-784, September 1971. 6 fig.

Descriptors: *Sea water, *Polarographic analysis, *Radioactive wastes, Cadmium, Sodium chloride, Salts, Calcium, Ions, Radioisotopes, Nuclear wastes, Metals, Cadmium radioisotopes, Chelation.
Identifiers: *EDTA, Ethylenediaminetetraacetic acid, Square wave polarography, Liquids, Complexing.

The characterization of radioisotopes in the marine environment is important to studies of their concentration in marine organisms. The addition of ethylenediaminetetraacetic acid (EDTA) to seawater can assist in such characterization by changing the ionic form of cationic radioisotopes. In this study, cadmium was used as a model for the study of the metal-EDTA complex formation in seawater using square-wave polarography. The complex formation of Cd-EDTA in seawater and in sodium chloride solution was studied. The rate of Cd-EDTA complex formation in seawater was lower than that of the same reaction in the corresponding solution of sodium chloride or calcium and sodium chloride. The influence of chloride and calcium ions on complex formation of Cd-EDTA in sodium chloride solutions was investigated and the results indicated that the degree of complex formation of cadmium with EDTA is diminished by the formation of cadmium monochloro complex and by the competition between calcium and cadmium. (Mortland-Battelle)
W72-09673

A METHOD FOR THE ANALYSIS OF FISH, ANIMAL, AND PULTRY TISSUE FOR CHLORINATED PESTICIDE RESIDUES,
Food and Drug Administration, Washington, D.C. Div. of Pesticide Chemistry and Toxicology.
M. L. Porter, S. J. V. Young, and J. A. Burke.
Journal of the Association of Official Anlytical Chemists, Vol. 53, p 1300-1303, November 1970. 3 tab, 7 ref.

Descriptors: *Analytical techniques, *Pesticide residues, Assay, Chlorinated hydrocarbon pesticides, Water pollution effects, Public health.
Identifiers: *Extraction techniques, Contamination (Food).

A method for extracting residues of chlorinated pesticides from fish, meat, and poultry tissue by blending with petroleum ether is described. The usual petroleum ether-acetonitrile partitioning and Florisil column chromatographic procedures are used for cleanup. A modification of the widely used petroleum ether-acetonitrile partitioning resulted in an improved cleanup with an insignificant loss in pesticide recovery. Levels of metabolically incorporated chlorinated pesticide residues extracted from fish, meat, and poultry tissue by the petroleum ether method were equivalent to residue quantities extracted by Soxhlet with chloroform-methanol (1 + 1). Recoveries of representative chlorinated pesticides added to samples of various tissues at levels of 0.1-2.0 mg/l ranged from 90% to 102%. (LeGore-Washington)
W72-09684

DETERMINATION OF NITRILOTRIACETIC ACID IN INLAND WATERS BY GAS CHROMATOGRAPHY OF THE TRIMETHYL ESTER,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. Murray, and D. Pololedo.
Journal of the Fisheries Research Board of Canada Vol 28 No. 7 p1043-1047. 1971. Illus.
Identifiers: *Gas chromatography, Ester, *Water analysis, *Nitrilotriacetic acid.

A method for the analysis of low concentrations of nitrilotriacetic acid (NTA) in natural waters was developed. The NTA was converted to the trimethyl ester and determined quantitatively by gas chromatography using methyl heptadecanoate as an internal standard. The lower limit of detection was 25 ug/liter of NTA. The identity of the ester was confirmed using a mas spectrometer-gas chromatograph combination.--Copyright 1972, Biological Abstracts, Inc.
W72-09711

RESIDUES OF DDT IN LAKE TROUT AS A FUNCTION OF AGE,
Cornell Univ., Ithaca, N. Y. Dept. of Entomology.
For primary bibliographic entry see Field 05C.
W72-09714

MONITORING METALS IN MARINE ANIMALS,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
J. E. Portmann.
Marine Pollution Bulletin, Vo. 2, No. 10, p 157-158, October 1971. 3 ref.

Descriptors: *Heavy metals, *Monitoring, Lead, Copper, Cadmium, Chromium, Zinc, Mercury, Shellfish, Fish, Foods, Analytical techniques, *Spectrophotometry, Water pollution, *Marine animals.
Identifiers: Seafood, *Atomic absorption spectrophotometry.

Routine monitoring of heavy metals in fish and shellfish from British waters indicates high levels in some bivalves, but these cannot be used to predict likely concentrations in finfish from the same areas. Cadmium, chromium, copper, lead, mercury, and zinc were measured by atomic absorption spectrophotometry after wet-ashing subsamples of homogenates using concentrated nitric, or nitric and sulfuric acids. Muscle and liver tissues of fish were analyzed separately. The concentrations in the livers were generally 2-5 times higher than in the muscles. No specific concentrations are given. Relative concentration comparisons are made for different species and culture areas. (Svensson - Washington)
W72-09718

HEAVY METALS IN UNITED STATES FISH,
Food and Drug Administration, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-09719

WATER QUALITY RECORDS OF THE SNOWY MOUNTAINS REGION, AUSTRALIA.
Snowy Mountains Hydro-Electric Authority, Cooma (Australia).
For primary bibliographic entry see Field 07C.
W72-09770

MYCOBACTERIA OF SEWAGE WATER AND SEDIMENT, (IN FRENCH),
Institut Pasteur, Lille (France). Laboratoire d'-Hydrobiologie.
H. Leclerc, R. Nguematcha, J. Debruyne, and A. Tacquet.
Ann Inst Pasteur Lille. Vol 22, p 177-188. 1971. English summary.
Identifiers: *Mycobacteria, Sediment, *Sewage, *Public health.

This study considers the investigation techniques for Mycobacteria in sewage. It emphasizes the high frequency of the various mycobacterial species. Among the 269 strains of Mycobacteria isolated from 163 water samples, 100 are M. avium. It proves the inefficiency of purification procedures.--Copyright 1972, Biological Abstracts, Inc.
W72-09777

5B. Sources of Pollution

QUALITY OF EFFLUENT FROM SWINE PRODUCTION AREAS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina Water Resources Research Inst., Raleigh.
J. W. D. Robbins, G. J. Kriz, and D. H. Howells.

Paper No. 69-706 presented at 1969 Winter meeting of the American Society of Agricultural Engineers Chicago, Illinois, December 9-12, 1969. 42 p, 21 fig, 4 tab, 21 ref. FWPCA Grant 13020 DGX.

Descriptors: *Farm wastes, Water quality control, *Surface waters, Discharge, Lagoons, Hogs, *Nitrates phosphorus, Coliforms, Biochemical oxygen demand, Chemical oxygen demand, *Toxicity, Antibiotics, Water pollution sources.
Identifiers: *Effluent disposal, Land application, Direct discharge, Automatic sampler, Feed additives.

Results are presented of the swine waste phase of a study initiated to identify the amounts of and factors governing pollutional loadings reaching surface waters and to answer whether and under what conditions animal wastes are a significant source of stream pollution. Knowledge of these factors is necessary to develop meaningful waste control, treatment, and disposal requirements for surface water protection. Results from representative swine waste management systems of lagooning, land disposal, and direct discharge to stream demonstrated the superiority of land disposal in controlling stream pollution. Discharge of lagoon effluents or direct discharge into surface water is unacceptable from a water quality standpoint. In land disposal, care must be taken that good management practices of soil and water conservation are followed to minimize movement of wastes into streams. The amount of wastes applied per unit area should be low enough to prevent excess nitrate levels in groundwater. Toxic substances in the wastes are a cause of difficulties in BOD tests on lagoon wastes. (Dorland-Iowa State)
W72-09151

THIN LAYER CHROMATOGRAPHY AND INFRA-RED AND ULTRA-VIOLET SPECTRA OF FENTHION AND SEVEN OF ITS DEGRADATION PRODUCTS,
Drexel Univ., Philadelphia, Pa. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-09182

STRUCTURE AND MODIFICATION OF CLOUDS AND FOGS,
State Univ. of New York, Albany. Research Foundation.
For primary bibliographic entry see Field 02B.
W72-09201

OPTIMAL SEARCH FOR POLLUTION SOURCES,
California Univ., Berkeley. Human Factors in Technology Research Group.
C. R. Glassey and R. M. Karp.
Operations Research Center, University of California, Berkeley, Report ORC 72-1, January 1972. 13 p, 1 fig, 1 tab, 1 ref. NSF GP-30961X and PHSR EC00260-05.

Descriptors: *Pollutant identification, *Water quality control, *Water pollution sources, *Streams, *Optimization, *Mathematical models, *Operations research, *Measurement.
Identifiers: *Huffman code.

Potential sources of a pollutant are located along a linear stream. By measuring the pollutant concentrations at two points along the stream, one can determine whether there is a source between the two points which is actually emitting the impurity. Presented as an optimal policy is a rule for choosing the place in which to split a polluted interval. When the sources are independent and have equal probability of polluting, the rule minimizes the expected number of measurements required to identify all polluters. (Bell-Cornell)
W72-09232

DISTRIBUTIONAL ECOLOGY AND BEHAVIORAL THERMOREGULATION OF FISHES IN RELATION TO HEATED EFFLUENT FROM A STEAM-ELECTRIC POWER PLANT (LAKE MONONA, WISCONSIN),
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05C.
W72-09236

PENETRATION OF BOG PEATS AND LAKE SEDIMENTS BY TRITIUM FROM ATMOSPHERIC FALLOUT,
Minnesota Univ., Minneapolis. Dept. of Botany.
E. Gorham, and R H. Hofstetter.
Ecology, Vol. 52, No. 5, p 898-902, Late Summer 1971. 4 fig.

Descriptors: *Lake sediments, *Tritium, *Peat, *Fallout, *Penetration, Bogs, Radioisotopes, Mosses, Lakes, Sampling, Minnesota, Wetlands, Connate water, Evapotranspiration, Fen, Diffusion, Path of pollutants, Equipment, Subsurface runoff, Sediments, Precipitation (Atmospheric), Water analysis, Soil analysis, Sampling.
Identifiers: Sphagnum, Picea mariana, Red Lake, Livingstone sampler, Jenkin sampler, Elk Lake, Deming Lake, Christmas Lake, Lake of the Clouds, Black spruce, Sample preservation.

Peat samples were collected with Livingstone and Jenkins samplers and by divers from the great wetland complex north of Upper Red Lake and from the deepest parts of four lakes in the forested part of Minnesota to investigate: (1) how deeply tritium penetrates peats and lake sediments and (2) whether past input pulses have been preserved in peat and sediment profiles. Lake water samples were also collected for comparison. Tritium in the surface bog peats of the Red Lake wetland exhibited about the same concentration as in atmospheric precipitation, which is still appreciably enriched by tritium from nuclear weapon testing. Past input pulses are not preserved in the peat profile, and the pattern of subsurface decline suggests that most of the modern precipitation rich in tritium is removed rapidly by evapotranspiration and by lateral runoff within the top 1.5 m of the 3.5-m thickness of little-decomposed Sphagnum peat at the crest of the raised bog. However, some bomb tritium has penetrated down to the discontinuity between the highly permeable Sphagnum peat and the underlying well-decomposed and much less permeable fen peat. In profundal lake sediments the influence of highly enriched precipitation has likewise been largely transitory and of major significance only in sediment depths of less than 1 m. The lake water samples contained tritium concentrations that were distinctly greater than most of those for atmospheric precipitation. Such results are not unexpected since annual rates of precipitation and evaporation were rather similar. (Holoman-Battelle)
W72-09240

CYANIDE EXTRACTION AND ELECTRODISPOSITION OF TRACE AMOUNTS OF RADIOACTIVE SILVER FROM LARGE BIOLOGICAL SAMPLES,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05A.
W72-09246

ARSENATE IN THE WESTERN NORTH ATLANTIC AND ADJACENT REGIONS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05A.
W72-09249

PHOTOCHEMISTRY OF BIOACTIVE COMPOUNDS. SOLUTION-PHASE PHOTOCHEMISTRY OF ASYMMETRIC TRIAZIN-5 (4H)-ONES,
Michigan State Univ., East Lansing. Dept. of Entomology.
B. E. Pape, and M. J. Zabik.
Journal of Agricultural and Food Chemistry, Vol. 20, No. 1, p 72-75, January/February 1972. 2 fig, 3 tab, 11 ref.

Descriptors: *Nitrogen compounds, *Herbicides, *Pesticide kinetics, *Organic pesticides, Path of pollutants, Chemistry, Chemical analysis, Alcohols, Solvents, Chemical reactions, Chemical precipitation, Oxidation, Mass spectrometry, Nuclear magnetic resonance, Degradation.
Identifiers: *Photochemistry, Photolysis, Methanol, Carbon tetrachloride, Benzene, Bioactive compounds, Heterocyclic compounds, Desulfurization, Thin layer chromatography, Gas liquid partition chromatography, Melting points, Infrared spectroscopy, Asymmetric triazin-5 (4H)-ones, Cyclohexyl, Tert-butyl, Isopropyl, 4-amino-6-R-3- (methylthio)-as-triazin-5 (4H)-ones, 3-hydroxyl-6-R-3- (methylthio)-1 2 4-triazin.

Three asymmetric heterocyclic nitrogen compounds recently tested for herbicidal activity were photochemically reacted in carbon tetrachloride, benzene, methanol, water or in their crystalline state. Photolysis, which was carried out on saturated solutions of 4-amino-6-R-3- (methylthio)-as-triazin-5 (4H)-ones (where R equals cyclohexyl or tert-butyl or isopropyl) at greater than 290 nm, resulted in reaction and precipitation of a major photoproduct: 5-hydroxy-6-R-3- (methylthio)-1,2,4,triazine. The structure, possible reaction mechanisms, and minor products of the starting materials as well as the major photoproducts were characterized by various techniques. Thin-layer chromatography and gas-liquid partition chromatography of starting materials and photoproducts suggested that the end products were more polar than their respective precursors. Mass spectroscopy of the photoproducts was characterized by a molecular ion m/e 15 units below their starting materials. The even mass number and isotopic abundance supported the loss of NH. Infrared spectroscopy data suggested the 1,2,4-triazine ring system as the photoproduct. Nuclear magnetic resonance data supported the proposed structural system and allowed assignment of structures to the photoproducts. The photolysis of triazinones under a wide range of reaction conditions and at wavelengths greater than 290 nm indicates the potential environmental significance of such nonbiological degradations. Determination of photoproduct formation and residual level in the field would dictate toxicological evaluations and analytical procedures necessary to studies of its occurrence and ecological 'burden'. (Mackan-Battelle)
W72-09250

DYNAMICS OF CONTAINED OIL SLICKS,
National Research Council of Canada, Ottawa (Ontario). Hydraulics Section.
For primary bibliographic entry see Field 05G.
W72-09258

INVESTIGATION AND MEASUREMENT OF RADIUM IN RAMSAR MINERAL WATER,
Tehran Univ. (Iran). Dept. of Environmental Health.
B. Khademi, and A. Mesghali.
Health Physics, Vol 21, No 3, p 464-466, September 1971. 3 tab, 3 ref.

Descriptors: *Mineral water, *Radium radioisotopes, *Springs, *Public health, Gamma rays, Hydrogeology, Correlation analysis, Data collections, Water pollution sources, Environmental effects, Foreign research, Water pollution sources, Epidemiology.
Identifiers: *Iran, Caspian littoral, Malignant disease.

Investigations of radioactivity of mineral waters in northern Iran are described. The study is a part of an overall investigation of malignant disease in the cancer-prevalent region comprising Mazandaran, Gorgan, Gilan, and northwestern Khorassan provinces. A mutual cooperation of WHO, Inter-

national Agency for Research on Cancer, the Ministry of Health and the University of Teheran assures the carrying out of these studies. Tables of data give the values for radium concentration in waters at 12 places and the environmental levels of gamma radiation in the Ramsar area, and the radium concentration in waters at 9 places in Khorassan province. Springs of mineral sulfurous waters are abundant in the Caspian littoral near Ramsar, some are used therapeutically. Ra 226 concentrations are above normal in some springs and differ from spring to spring. The concentration range is between 20,000 and 10,000 pCi per liter. Comparison of the values with data from mineral springs in Khorassan indicate that radioactivity in the Ramsar area mineral water is due to radiation in geologic strata through which the water passes. (Lang-USGS)
W72-09266

HYDROLOGIC INVESTIGATION OF SMALL WATERSHEDS IN OHIO, PHASE I: 1966-1969,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 02A.
W72-09296

SOIL NITROGEN CYCLE--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02G.
W72-09299

DDT RESIDUES IN SALINAS RIVER SEDIMENTS,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
J. D. Routh.
Bulletin of Environmental Contamination and Toxicology, Vol. 7, No. 2/3, p 168-176, February-March 1972. 4 fig, 9 ref.

Descriptors: *DDT, *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Path of pollutants, *River sediments, California, Sediments, Gas chromatography, Pesticide kinetics, Separation techniques, DDE, DDD, Solvent extractions.
Identifiers: *River sediments, *Electron capture gas chromatography, Salinas River (Calif), Metabolites, Chemical interference, p,p'DDT.

Approximately 100 grams of the top three inches of river bottom sediments were collected over a four-week period from selected sites along the Salinas River (California) and analyzed by gas chromatography in order to determine the amount of DDT residues in the Salinas River, their areas of concentration, and their rate and mode of translocation. The samples were extracted into acetone-hexane and the extraneous co-extractives removed using a silica gel column cleanup procedure. About 30 minutes before injection into the gas chromatograph, 0.5 ml of metallic mercury was added to eliminate interference by sulfur-containing contaminants. Except for one sampling site, the levels of DDT derivatives (p,p'-DDT being most common) along the river were fairly constant, ranging in most cases below 10 ppb. It was found, to the 99 percent confidence level, that the highest DDT derivative content positively correlated with the finest sediment size. The amount of sediment translocated along the river was or appeared to be directly correlated with water flow rate: the higher the rate, the greater the sediment content. The amount of pesticide in a given area would then be expected to fluctuate with the rate of water flow. (Holoman-Battelle)
W72-09313

A COMPOSITE ARGININE GLUCOSE MEDIUM FOR THE CHARACTERIZATION OF PSEUDOMONAS AERUGINOSA AND OTHER GRAM NEGATIVE BACILLI,
Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Brewing and Biological Sciences.
For primary bibliographic entry see Field 05C.
W72-09320

HYDROLYSIS AND SOLVENT PARTITION OF PHOSDRIN AND RELATED ORGANOPHOSPHATES,
California Univ., Davis. Dept. of Environmental Toxicology.
J. N. Seiber, and J. C. Markle.
Bulletin of Environmental Contamination and Toxicology, Vol. 7, No. 2/3, p 72-74, February/March 1972. 2 tab, 7 ref.

Descriptors: *Hydrolysis, *Organophosphorus, *Separation techniques, *Gas chromatography, Pesticide kinetics, Phosphothioate pesticides, Organic pesticides, Structural stability, Solvent extractions.
Identifiers: *Phosdrin, *Solvent partitioning, Azodrin, Bidrin, DDVP, Methyl parathion, Organic solvents, Isomers, Hydrolytic stability.

The solvent partition behavior and the hydrolytic stability of Phosdrin were studied in comparison to Azodrin, Bidrin, DDVP, and methyl parathion using gas chromatography. Partition p-values were determined by adding the pesticide to an equilibrated water-organic solvent mixture, analyzing an aliquot by GLC, adding the organic phase and shaking for a minute, then analyzing an aliquot of the aqueous phase. Hydrolytic stabilities were determined from GLC analysis of pesticide-acetone standards in deionized water. The partition p-values indicated that most of Phosdrin is not removed from water with a single hexane extraction and that the behavior of Azodrin and Bidrin is quite similar. If more than one hexane partition is done, two-thirds DDVP can be extracted whereas methyl parathion is almost completely extracted. Chloroform extracts about 95 percent of the alpha- and beta-isomers of Phosdrin; very similar results were obtained for the other organophosphates. Phosdrin has been shown not to undergo rapid hydrolysis. After a week in water, 99 percent of alpha-and 94 percent of beta-Phosdrin was undegraded as compared to 91 percent of Azodrin. (Holoman-Battelle)
W72-09321

VARIATIONS OF SULFUR ISOTOPE RATIOS IN SAMPLES OF WATER AND AIR NEAR CHICAGO,
Argonne National Lab., Ill. Chemistry Div.
B. D. Holt, A. G. Engelkemeir, and A. Venters.
Environmental Science and Technology, Vol. 6, No. 4, p 338-341, April 1972. 7 fig, 1 tab, 15 ref.

Descriptors: *Sulfates, *Distribution patterns, *Path of pollutants, Surface water, Rain, Sewage effluents, Air, Detergents, Sea water, Mass spectrometry, Municipal water, Water wells, Chemical analysis, Rivers, Effluents, Sulfur, Mississippi River, Lake Michigan, Analytical techniques, Methodology, *Illinois, Water analysis.
Identifiers: *Sulfur radioisotopes, Salt Creek, Isotope-ratio mass spectrometer, Enrichment, Little Vermillion River, Addison Creek, Des Plaines River, DuPage River, Fox River, Lake Geneva, Illinois River, Calumet Sag Canal, Chicago Sanitary and Ship Canal, Sulfur-34, *Chicago (Ill).

Sulfur-34 enrichments were measured in the sulfates of surface waters, municipal wells, sewage treatment plant effluents, rain, and air in a suburban area west of Chicago. Randomly selected household detergents, seawater samples, and water samples from streams in northern Illinois, Lake Michigan, and 13 peripheral streams flowing into the lake were also analyzed. The study was centered on Salt Creek which, with neighboring streams, apparently characterizes the glacial-deposit area as being depleted in sulfur-34, with repsect to meteoritic troilite. The sulfates were precipitated as BaS04, pyrolyzed at 800 C and weighed for measurement of sulfate concentration. The SO2 obtained from BaS04 pyrolysis was analyzed on a high-precision, dual-collector, isotope-ratio mass spectrometer. Enrichment of each sample with respect to a secondary standard was calculated from two measured ratios, 66/64 and 50/48. The average enrichment values indicate that Salt Creek and the nearest neighboring streams were characteristically negative. Three apparent perturbants of sulfur-34 enrichment in the small stream were rain, earth-surface disturbances, and effluents from sewage treatment plants. Deep municipal wells (greater than 350 meters) were strongly enriched in sulfur-34 and shallow municipal wells (less than 85 meters) were strongly depleted. (Holoman-Battelle)
W72-09336

THE BIODEGRADATION OF SOME SULFATED ALKANOLAMIDES,
Eastern Regional Research Lab., Philadelphia, Pa.
T. C. Cordon, E. W. Maurer, and A. J. Stirton.
Journal of the American Oil Chemists' Society, Vol 49, No 3, p 174-177, March 1972. 5 fig, 1 tab, 10 ref.

Descriptors: *Biodegradation, *Detergents, *Activated sludge, Aerobic conditions, Soils, Rivers, Sewage, Oxygen, Sulfonates, Turbidity, Alkylbenzene sulfonates, Cultures, Analytical techniques, Sodium compounds, Salts, Nutrients, Carbon, Bacteria, Anaerobic conditions, Surfactants, Linear alkylate sulfonates, Sulfates, Rivers.
Identifiers: Media, Microaerophilic conditions, Linear alkyl-benzene sulfonate, MBAS, Sulfated alkanolamides, Sodium hexadecyl sulfate, Schuylkill River, Sample preservation, Ions, Fate of pollutants.

Biodegradability tests on sulfated alkanolamides were carried out in a controlled nutrient medium under aerobic and microaerophilic conditions in river water and in soil. Under aerobic conditions, the Esso controlled nutrient procedure was used with detergents at 40 ppm as the sole source of carbon and energy to the medium. Biodegradation was carried out at 25 C in stirred solutions with the course of breakdown followed by measuring the loss of MBAS and organic carbon and the formation of sulfate ions. Microaerophilic tests were carried out at 35 C in 4 liter aspiration bottles using 2 liters of medium. Although degradation occurred under all conditions, it was more rapid when the oxygen concentration was high. Under aerobic conditions, MBAS reduced to zero in 2 days, and most of the organic carbon was gone in 4 days. Degradation was rapid in sterilized river water inoculated with anaerobic sewage sludge under microaerophilic conditions and in soil. The former indicates that microorganisms in the sludge rapidly reduce the MBAS of sulfonated alkanolamides. LAS was not degraded in any of the microaerophilic tests; LAS reached 2.5 ppm in 15 days in the soil degradability tests with effluents from fat-based detergents. (Mortland-Battelle)
W72-09344

THE RELATIVE IMPORTANCE OF FRESHWATER INPUT, TEMPERATURE AND TIDAL RANGE IN DETERMINING LEVELS OF DISSOLVED OXYGEN IN A POLLUTED ESTUARY,
Clyde River Purification Board, East Kilbride (Scotland).
D. W. Mackay, and J. Gilligan.
Water Research, Vol 6, No 2, p 183-190, February 1972. 1 fig, 4 tab, 2 ref.

Descriptors: *Dissolved oxygen, *Estuaries, *Mathematical models, Water pollution sources, Water temperature, Tidal effects, Regression analysis, Computer programs, Salinity, Water quality, Model studies, Water analysis.
Identifiers: Scotland, Freshwater input, Clyde River.

The individual and combined effects of freshwater input, temperature, and tidal range on levels of dissolved oxygen in a highly polluted estuary have been established. Freshwater input strongly influenced dissolved oxygen in the upper reaches while the effect became less marked further downstream until, near the sea, DO decreased with increasing freshwater input. The effects of temperature were less pronounced but meaningful and also reversed near the sea. Increased tidal range had a beneficial effect on DO levels, which reached a maximum at middle stations along the estuary. A mathematical model was constructed using multiple regression analysis to predict dissolved oxygen in relation to the three parameters at regularly spaced sampling sites along 38 km of the estuary. Using this model, DO could be predicted to within plus or minus 11 percent saturation for 68 percent of the time and to within plus or minus 22 percent saturation for 95 percent of the time. (Mortland-Battelle)
W72-09345

BACTERIAL POPULATIONS AS COMPONENTS OF OCEANIC ECOSYSTEMS,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
Yu. I. Sorokin.
Marine Biology, Vol 11, No 2, p 101-105, November 1971. 4 fig, 2 tab, 14 ref.

Descriptors: *Marine bacteria, *Ecosystems, *Productivity, *Food chains, Microbial degradation, Metabolism, Cycling nutrients, Oceans, Population, Biomass, Primary productivity, Marine microorganisms, Energy budget, Benthic fauna, Photosynthesis, Diatoms, Microscopy, Carbon radioisotopes, Methodology, Pacific Ocean, Invertebrates, Marine animals, Crustaceans, Copepods, Larvae, Gastropods, Oysters, Annelids, Worms.
Identifiers: *Bacterioplankton, Filter feeders, Eucalanus attenuatus, Pocillipora damnicornis, Toxadocca violacea, Megalomma, Biddulphia, Tunicates, Veligers, Corals, Sponges, Polychaetes, Benthic microflora, Membrane filters, Macroinvertebrates.

In assessing the real participation of bacteria in the metabolism and productivity of marine ecosystems: (1) the numbers and biomass of bacteria were estimated on stained membrane filters by microscopy; (2) the production of bacteria and destruction were measured by a radiocarbon method using empyric ratios between dark CO2 assimilation (mg C), bacterial production (mg C), and rate of destruction (mg oxygen consumed); and (3) the percent of bacteria in aggregates was estimated by filtering labeled natural bacterioplankton, using filters of different pore sizes. Based on sampling data using the bioluminescence indicator method, active bacterial populations are found at 70-90 m and 450-550 m, even in oligotrophic tropical waters. Bacterial production in tropical waters under 1 sq m was recorded in the range of 0.5-1 g C/day; the corresponding rate of bacterial decomposition of organic matter was 1-3 g C/sq m/day. This exceeds the primary production of photosynthesis as measured by the C-14 method. Feeding experiments have shown that fine-filtering invertebrates, such as Cladocera, sponges or serpulid worms, can feed on planktonic bacteria of concentrations between 0.1-1 g/cu m raw biomass. About 30 percent of the cells of the natural population of planktonic bacteria compose aggregates larger than 4 microns. The number, biomass, and production of the benthic microflora change several hundred times in the bottom sediments from the lagoon to the deep oceanic floor. (Holoman-Battelle)
W72-09351

MATHEMATICAL MODEL FOR FATE OF POLLUTANTS IN NEAR-SHORE WATERS,
IIT Research Inst., Chicago, Ill.
W. J. Wnek, and E. G. Fochtman.
Environmental Science and Technology, Vol. 6, No. 4, p 331-337, April 1972. 6 fig, 1 tab, 13 ref.

Descriptors: *Mathematical models, *Water quality control, *Forecasting, Lakes, Model studies, Pollution abatement, Computers, Lake Michigan, Computer programs, Dispersion, Flow rates, Water pollution.
Identifiers: *Fate of pollutants.

Modified mathematical techniques have been utilized to develop a computer program for calculating and predicting the fate of pollutants in the near-shore waters of Lake Michigan. The program requires little computer time and is more amenable to prediction of conditions at greater distances or times from the source. The effects of multiple sources, boundaries, and reaction on decay rates were considered in the development of this particular mathematical model. The model also considers variable diffusion coefficients and variable velocities. Use of transforms and Green's function avoids the finite differences approach, permits rapid calculation, and results in a stable answer for long distances from the source. A sample calculation involving three sources is given. (Holoman-Battelle)
W72-09377

LIQUID WASTES FROM CANNING AND FREEZING FRUITS AND VEGETABLES.
National Canners Association, Berkeley, Calif. Western Research Lab.
For primary bibliographic entry see Field 05D.
W72-09390

A DIRECT METHOD OF MEASURING BENTHIC PRIMARY PRODUCTION IN STREAMS,
Connecticut Univ., Storrs. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W72-09405

NUCLEIC ACID ENZYME STUDIES OF NONFERMENTATIVE GRAM-NEGATIVE BACTERIA USING THIN-LAYER CHROMATOGRAPHY,
Minnesota Univ., Minneapolis. Dept. of Laboratory Medicine.
For primary bibliographic entry see Field 05A.
W72-09408

OCEANS AS ALPHABET SOUP: FOCUS ON DDT AND PCB'S,
R. H. Gilluly.
Science News, Vol 101, No 2, p 30-31, January 8, 1972.

Descriptors: *DDT, *Polychlorinated biphenyls, *Distribution patterns, Chlorinated hydrocarbon pesticides, Marine plants, Marine animals, Persistence, Foot chains, Trophic level, Vertical migration, Path of pollutants, Pesticide removal, Atlantic Ocean, Phytoplankton, Zooplankton, Absorption, Water pollution effects, Water pollution.
Identifiers: Biological magnification, Fate of pollutants.

Although DDT may not directly harm man, it can indirectly affect him by attacking desirable flora and fauna in the environment. Polychlorinated biphenyls (PCB's) are likewise contaminating a diversity of organisms. There is a direct relationship between amounts used regionally to effects upon organisms. The worldwide pathway appears to proceed from the land, through the atmosphere, to the oceans. Biologically, it appears to accumulate from simpler organisms up the food chain to more complex organisms, with magnification taking place between each trophic level. However, PCB's are able to take different physical and biological routes. Daily vertical migration by organisms is thought to be responsible for removing DDT and preventing magnification to concentrations which may cause extinction in more biologically active upper levels of oceans. There are apparently no consistently lateral gradients of DDT or PCB distribution in the Atlantic Ocean. It is suggested that the U.S. adopt an international inventory, monitoring, and control system for toxic chemicals and help underdeveloped nations cope with their pest problems with better methods. (Mackan-Battelle)
W72-09409

MERCURY IN THE ENVIRONMENT - AN ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn.
G. M. Caton, D. P. Oliveira, C. J. Oen, and G. U. Ulrikson.
Available from the National Technical Information Service as ORNL-EIS-71-8, $3.00 in paper copy, $0.95 in microfiche. Report No. ORNL-EIS-71-8, May 1972, 271p. NSF-AAA-R-4-79.

Descriptors: *Bibliographies, *Reviews, *Publications, *Environment, *Mercury, Environmental effects, *Food chains, Human population, Plant population, Ecology, Ecosystems, Water pollution, Water pollution sources, Water pollution effects, Toxicity, Bioassay, Assay.
Identifiers: Concentration, Reconcentration.

This computerized bibliography contains 562 citations on the role of mercury in the environment. The entries are arranged in the following subject categories: Reviews, Bibliographies, and General Papers; Natural Occurrence, Mining, and Extraction; Uses and Consumption; Pollution Sources and Pollution; Chemistry; Control, Abatement, and Restoration; Legal and Political Aspects; Physiological and Toxicological Aspects; and Ecosystem Movement. The bibliography is cross-referenced and three indexes are provided: author, keyword, and permuted title index. (Houser-ORNL)
W72-09420

PLAN FOR THE MANAGEMENT OF AEC-GENERATED RADIOACTIVE WASTES,
Division of Waste Management and Transportation (AEC), Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-09424

RADIOACTIVE FALLOUT IN AIR AND RAIN (RESULTS TO MIDDLE TO 1971),
Atomic Energy Research Establishment, Harwell (England).
For primary bibliographic entry see Field 05A.
W72-09425

KINETICS OF OH RADICAL REACTIONS IN IRRADIATED ORDINARY AND SUPERCOOLED WATER,
Magyar Tudomanyos Akademia Kozponti Fizikai Kutato Intezete, Budapest.
I. Kules, and R. Schiller.
Available from NTIS as KFKI-71-21; $3.00 paper copy; $0.95 microfiche. Report KFKI-71-21, (1971), 10p, From Third Symposium on Radiation Chemistry, Tihany, Hungary, May 10, 1971. (CONF. 710517-1).

Descriptors: *Water properties, *Chemical properties, *Heated water, *Thermal power, *Hydrothermal studies, *Water colling, *Kinetics, Energy, Hydrogen bonding, Water chemistry, Irradiation, Cobalt, Equations, Diffusion, Temperature control.
Identifiers: Noyes equation.

Studies were made of the kinetic nature of OH radical reactions including temperature-dependent kinetics of competing OH scavenger reactions and diffusion-controlled processes. Investigations were also made on whether supercooling had any effect, besides that of the change in temperature, on reaction kinetics. Irradiations were carried out using a 60 Co gamma source. Results indicated that supercooling did not exert any particular effect on competition kinetics. All the OH radical reactions were diffusion-controlled and obeyed the Noyes equation. Detail is given of the various experiments. (Houser-ORNL)

W72-09428

ENVIRONMENTAL RADIOACTIVITY IN NEW ZEALAND. QUARTERLY REPORT, OCT.-DEC. 1970.
National Radiation Lab., Christchurch (New Zealand).
For primary bibliographic entry see Field 05A.
W72-09429

RAPID METHODS FOR MEASURING RAIDOACTIVITY IN THE ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 05A.
W72-09437

SAMPLING AND ANALYTICAL SYSTEMS FOR MEASURING ENVIRONMENTAL RADIOACTIVITY,
California Univ., Livermore. Lawrence Radiation Lab.
For primary bibliographic entry see Field 05A.
W72-09453

PREDICTION OF THE FLORIDA RED TIDE BY MEANS OF THE IRON INDEX; RED TIDE, IRON AND HUMIC ACID LEVELS IN STREAMS.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Marine Science and Technology,
R. M. Ingle, and D. F. Martin.
Environmental Letters, Vol. 1, No. 1, p 69-74, 1971. 10 ref. USPHS 1 K04-GM 42569-02.

Descriptors: *Red tide, *Iron, *Humic acids, *Forecasting, Water pollution sources, Water pollution, Gymnodinium, Florida.
Identifiers: *Iron index, Charlotte Harbor (Fla), Growth stimulation.

A new means of predicting the occurrence of Florida red tide outbreaks is proposed: the iron index. This index is defined as the total amount of iron potentially delivered to an outbreak during a three month period. The success of the critical iron index in accounting for past red tides and in predicting future outbreaks in the Charlotte Harbor area is significant. The probable critical factors are the species and the amount of iron compounds delivered to a potential outbreak area. Because of the relationship between iron and humic acid, the success of the iron index may be due to the influence of iron-humic acid complexes in stimulating the growth of Gymnodinium breve. However, the relationship of iron and humic acid levels to a third factor--rainfall--may raise another interpretation; that the iron index is really a measure of the humic acid levels in the Peace River and that these chelating agents are the significant growth stimulating factors. (Svensson-Washington)
W72-09524

SELF-DIFFUSION OF TRACE CONCENTRATIONS OF CE-144, PM-147, AND EU-155 IN WATER SOLUTIONS,
Ceskoslovenska Akademie Ved, Prague. Ustav Jaderneho Vyzkumu.
F. Kepak, and J. Kriva.
Journal of Inorganic Nuclear Chemistry 1971, Vol. 33, p. 1741-1748, June 1971.

Descriptors: *Diffusion, *Dispersion, *Circulation, *Ion exchange, *Mixing, Transmissivity, Water pollution, Water pollution sources, *Radioisotopes, Hydrogen ion concentration, Water chemistry, Acidity, Alkalinity, Chemical properties, Monitoring.
Identifiers: pH effect, Concentration, Self-diffusion.

Self-diffusion coefficients of 144Ce, 147Pm, and 155Eu in water solutions have been determined as functions of pH at two ionic strengths microgram = 0.01 and 0.1. From the values of the self-diffusion coefficients and viscosity the ion and Ce (III), Pm (III), and Eu (III) colloid hydroxide radii have been calculated. The values of the self-diffusion coefficients have been within 10-6-10-7 cm2/sec. The radii of colloidal particles of Ce (III), Pm (III), and Eu (III) hydroxides at microgram = 0.1 have been 37 deg A, 22 deg A and 18 deg A respectively. Detailed data are given in tabular form. (Houser-ORNL)
W72-09530

DISTRIBUTION OF CESIUM-137 AND NATURALLY OCCURRING RADIONUCLIDES IN SEDIMENTS OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. School of Public Health.
A. Plato.
Available from Sup Doc, US Gov't. Printing Office, Washington, D.C.-$0.50/copy. Radiation Data and Reports, Vol. 13, No. 4, p. 181-187, April 1972, 7 fig., 1 tab., 5 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Monitoring, *Measurement, *Radioactivity, *Fallout, Nuclear explosions, Civil defense, *Lake Michigan, Bottom sediments, Cesium, Potassium, Radium, *Lake sediments.
Identifiers: Weapons testing, Concentration, Monitor background, *Cesium-137.

Ten nuclear power reactors are scheduled for operation on Lake Michigan by 1976. The plants are owned by six power companies which formed 'The Lake Michigan Utility Study Group' in order to study problems common to all the nuclear plants. Measurements of radioactivity in bottom sediments of Lake Michigan were made during 1969 and 1970. The only manmade radionuclide found was cesium-137 which originated from over two decades of atmospheric testing of nuclear weapons. A correlation was observed between accumulation of cesium-137 in sediments and water current patterns in Lake Michigan. Concentrations of naturally occurring potassium-40 and radium-226 were found to correlate with the type of sediment present. (Houser-ORNL)
W72-09532

RADIOACTIVITY LEVELS IN SELECTED OHIO STREAMS; THE GREAT MIAMI RIVER, THE LITTLE MIAMI RIVER, AND MILL CREEK; JUNE-AUG. 1968.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Programs.

Available from Sup. Doc., US Gov't. Printing Office, Washington, D.C.-$0.50/copy. Radiation Data and Reports, Vol. 13, No. 4 p. 189-194, April 1972, 1 fig, 5 tab, 15 ref.

Descriptors: *Radioactivity, *Radioactivity effects, Rivers, Streams, *Measurement, Water pollution, Water pollution sources, Radioactive wastes, Waste disposal, *Strontium, *Uranium, *Radium, *Lead, Public health, *Ohio.
Identifiers: *Great Miami River, Little Miami River, Mill Creek, *Thorium, Concentration.

A water quality study of the Little Miami River, Great Miami River, and Mill Creek was conducted by the Office of Water Programs, U.S. Environmental Protection Agency. Analyses were performed for uranium, radium-226, lead-210, thorium and strontium-90. Uranium concentrations in the Little Miami River, Great Miami River, and Mill Creek averaged 0.4, 0.9, and 0.3 microgram/liter, respectively. Radium-226 concentrations averaged 0.08, 0.11, and 0.04 pCi/liter, respectively. Strontium-90 concentrations averaged 0.7, 0.4, and 1.1 pCi/liter, respectively. The average thorium concentration was less than 3 microgram/liter in all three streams. Lead-210 averaged less than 0.2 pCi/liter in the Little and Great Miami Rivers and 0.7 pCi/liter in Mill Creek. Strontium-90 concentration in the Rivers was below the limits for drinking water. The use of the Great Miami River for disposal of liquid radioactive wastes from two nuclear installations has not produced any changes in radiological water quality which are of public health significance. (Houser-ORNL)
W72-09533

ADSORPTION OF LINDANE AND DIELDRIN PESTICIDES ON UNCONSOLIDATED AQUIFER SANDS,
Wisconsin Univ., Madison. Water Chemistry Program.
F. R. Boucher, and G. F. Lee.
Environmental Science and Technology, Vol 6, No 6, p 538-543, June 1972. 9 fig, 2 tab, 9 ref.

Descriptors: *Adsorption, *Pesticides, *Sands, *Aquifers, *Path of pollutants, Dieldrin, Water temperatures, Hydrogen ion concentration, Organic matter, Lakes, Wisconsin.
Identifiers: Lindane.

The adsorption of lindane and dieldrin on natural aquifer sand from Portage County, Wis., was investigated in laboratory batch tests. From aqueous solutions whose concentrations were in the range of 5 to 500 micrograms of pesticide per liter, the corresponding adsorption capacity of the sand was in the range of nanograms per gram. The range of temperature and pH likely to occur in an aquifer would have no significant effect on the uptake of dieldrin and lindane. The naturally occurring dissolved organics present in two Wisconsin lake waters were found to reduce the adsorption of dieldrin. However, lindane adsorption was unaffected by the same organics. Nearly 70% of the adsorbed lindane was leached in three successive washes of distilled water. In contrast, less than 20% of the dieldrin adsorbed by the aquifer sand was removed after three washes. (Knapp-USGS)
W72-09539

OCCURRENCE AND DISTRIBUTION OF TRACE ELEMENTS IN NEW JERSEY STREAMS,
Geological Survey, Trenton, N.J.
For primary bibliographic entry see Field 05A.
W72-09545

PROCEEDINGS, 1971 TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.
Oregon State Univ., Corvallis. Engineering Experiment Station.

Oregon State University Engineering Experiment Station Circular No 42, 1971. 343 p.

Descriptors: *Conferences, *Estuaries, *Pacific Northwest U. S., Sedimentation, Model studies, Hydrodynamics, Sediment transport, Ecology, Water law, Water resources development.

The texts of papers delivered by the invited speakers to the first Technical Conference on Estuaries of the Pacific Northwest are presented. Sessions were devoted to modeling, hydrodynamics, sediment transport, the ecology of estuaries, state and national legal policies and standards affecting developments of estuaries. (See W72-09548 thru W72-09551) (Knapp-USGS)
W72-09547

THE POTENTIAL OF PHYSICAL MODELS TO INVESTIGATE ESTUARINE WATER QUALITY PROBLEMS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. Simmons.
In: Proceedings of 1971 Technical Conference on Estuaries of the Pacific Northwest, Oregon State University Engineering Experiment Station Circular No 42, p 4-28, 1971. 21 fig.

Descriptors: *Estuaries, *Hydraulic models, *Pacific Northwest U. S., Harbors, Bays, Tides,

Water circulation, Dispersion, Currents (Water), Model studies, Salinity, Path of pollutants, Navigation, Dredging.

Hydraulic models were made of the Columbia, Umpqua, Grays Harbor and Tillamook estuaries in the Pacific Northwest; in addition some discussion is given of San Francisco Bay, San Diego Bay and New York Bay. These models have been verified to reproduce tides, tidal and river currents, and salinities for prototype conditions. Tests of pollutant release and dispersion have been conducted to simulate flushing capabilities on these and other models. Salinity intrusion, navigation, dredging and shoaling problems are typical of the studies that may be made using these models. (See also W72-09547) (Knapp-USGS)
W72-09548

APPLICATIONS OF SOME NUMERICAL MODELS TO PACIFIC NORTHWEST ESTUARIES,
Pacific Northwest Water Lab., Corvallis, Oreg.
R. J. Callaway.
In: Proceedings of 1971 Technical Conference on Estuaries of the Pacific Northwest, Oregon State University Engineering Experiment Station Circular No 42, p 29-97, 1971. 17 fig, 3 tab, 63 ref.

Descriptors: *Estuaries, *Mathematical models, *Simulation analysis, Hybrid computers, *Pacific Northwest U. S., Dispersion, *Diffusion, Path of pollutants, Tides, Tidal effects, Water level fluctuations, Water circulation, Streamflow, *Oregon, *Washington.

Physical-chemical features of some Oregon and Washington estuaries are discussed in relation to existing or potential pollution problems. Available mathematical models of flow and dispersion phenomena are reviewed and applications of a steady-state model, a time-variable model, and a box model are discussed. The effects of estuaries on oceans are illustrated using the Columbia River and Cook Inlet as examples. Recent modeling efforts on two aspects of the simulation of estuarine processes include representation of currents and water levels, and representation of diffusion and the local change of concentration due to currents, diffusion, and source-sink terms. (See also W72-09547) (Knapp-USGS)
W72-09549

REMOTE SENSING ACQUISITION OF TRACER DYE AND INFRARED IMAGERY INFORMATION AND INTERPRETATION FOR INDUSTRIAL DISCHARGE MANAGEMENT,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
J. R. Eliason, D. G. Daniels, and H. P. Foote.
In: Proceedings of 1971 Technical Conference on Estuaries of the Pacific Northwest, Oregon State University Engineering Experiment Station Circular No 42, p 126-172, 1971. 23 fig, 3 ref.

Descriptors: *Path of pollutants, *Tracers, *Remote sensing, *Data collections, *Data processing, Instrumentation, Water temperature, Model studies, Mathematical models, Distribution patterns, Water pollution control, Dye releases, Tracking techniques, Hybrid computers.

Detailed patterns of waste movement may be predicted in surface water by digital modeling techniques. Data are collected using a light aircraft flying at speeds greater than 100 miles per hour. Tracer dye tests may be conducted with a sensitivity to 1 ppb and temperature patterns may be mapped with 0.5 deg C accuracy. Techniques are available for computer reduction of the data. Output from the models is in the form of isoconcentration or isothermal plots of the pollutant distribution and its variation with time. This information may be used for assessing the environmental impact of wastewater discharges and for providing data needed for industrial plant siting. (See also W72-09547) (Knapp-USGS)
W72-09550

STUDIES OF SEDIMENT TRANSPORT IN THE COLUMBIA RIVER ESTUARY,
Geological Survey, Portland, Oreg. Water Resources Div.
D. W. Hubbell, J. L. Glenn, and H. H. Stevens, Jr.
In: Proceedings of 1971 Technical Conference on Estuaries of the Pacific Northwest, Oregon State University Engineering Experiment Station Circular No 42, p 190-226. 12 fig, 2 tab, 13 ref.

Descriptors: *Sediment transport, *Columbia River, *Estuaries, *Tracers, Data collections, Suspended load, Bed load, Instrumentation, Sampling, Surveys, Radioisotopes, Fallout, Path of pollutants, Radioactive wastes, Sedimentation, Turbidity.

Information on sediment transport and deposition in the Columbia River estuary is obtained by measuring and sampling the flow, surveying the bed with acoustic techniques, and determining radionuclide levels. Temporal and spatial variations in suspended-sediment concentrations and in suspended-sediment discharges are large and are affected significantly by a turbidity maximum that develops and migrates longitudinally in the estuary. Side-scan sonar records obtained during a period of relatively low river flow indicate predominantly landward transport of sediment along the bottom in deep channels upstream from the mouth to about mile 14 and predominantly seaward transport on shallow slopes marginal to the channels downstream to about mile 5. A mass-balance equation that considers the amount of Zn-65 in the estuary bed and the net inflow of Zn-65 to the estuary suggest that approximately 30% of the silt and clay that enters the estuary from the river is retained there. Becuase of the complex character of estuary flows, detailed information on transport can be obtained only by making observations throughout tidal cycles and over extended periods of time. (See also W72-09547) (Knapp-USGS)
W72-09551

DISPOSAL OF SOLID ALUMINUM PROCESS WASTES IN THE OCEAN,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W72-09552

DESIGN AND CONSTRUCTION OF A SALT-WATER ENVIRONMENT SIMULATOR,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W72-09553

METHYLATION OF PENTACHLOROPHENOL BY TRICHODERMA VIRGATUM,
Western Forest Products Lab., Vancouver (British Columbia).
A. J. Cserjesi, and E. L. Johnson.
Canadian Journal of Microbiology, Vol. 18, No. 1, p 45-49, 1972. 1 fig, 2 tab, 12 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Bacteria, *Pesticide toxicity, *Fungi, Pesticide kinetics, Pesticide removal, Chemical reactions, Biodegradation, Pesticides, Bioassay, Cultures, Metabolism, Water pollution effects, Path of pollutants.
Identifiers: *Methylation, *Pentachlorophenol, *Trichoderma virgatum, Pentachloroanisole, Biotransformation, Culture media.

To investigate the possible mechanism of degradation of pentachlorophenol (PCP), a pesticide constituent, a solution of 2 percent malt extract containing sodium pentachlorophenate was used as a culture medium for Trichoderma virgatum. A spore suspension of the organism was added to the medium and incubated in darkness at 25 C for 0-33 days. Colorimetric analysis showed up to 95 percent reduction of PCP by the organism. To check the nature of the end product, fungi mycelium were extracted and proportional volumes methylated or silylated and samples containing less than 5 ng PCP were gas chromatographed. Pentachloroanisole (PCA) was detected as the methylation product of PCP by chromatography and confirmed by tests of its melting point and infrared spectrum. The formation of pentachloroanisole, however, did not account for the total loss of pentachlorophenol in the medium, suggesting that this reaction is only the first step in the metabolism of this compound or a parallel reaction to degradation. A test to compare the toxicity of PCP and PCA was also conducted by inoculating various fungi into media containing the compounds at different concentrations, and by measuring the survival time of juvenile Coho salmon to 2 mg/l PCP and 4 mg/l of PCA. Pentachloroanisole was much less toxic than pentachlorophenol to Trichoderma virgatum, Cephaloascus fragrans, and Pencillium sp., as well as to fish in laboratory toxicity tests. (Mackan-Battelle)
W72-09562

THE DISTRIBUTION OF CESIUM, RUBIDIUM, AND POTASSIUM IN THE QUASI-MARINE ECOSYSTEM OF THE SALTON SEA,
California Univ., San Diego.
D. R. Young.
Available from the National Technical Information Service as UCSD-34-P-71-11, $3.00 in paper copy, $0.95 in microfiche. Report No. UCSD-34P71-11, 1970. 234 p, 14 fig, 41 tab, 57 ref.

Descriptors: *Cesium, *Potassium, *Ecosystems, *Alkali metals, Plankton, Food chains, Fish, Trophic level, Seawater, Water temperature, Bioassay, Radioisotopes, Distribution patterns, Nuclear wastes, Sediments, Phytoplankton, Zooplankton, Mullets, Spectrometers, Food webs, Worms, Potassium radioisotopes, Seasonal, Colorado River, Sampling, Water quality, Dissolved solids, Diatoms, Copepods, Ions, Absorption, Water analysis, DDT, Heptachlor, Hydrocarbon pesticides, Endrin, Ions, Invertebrates, Mussels, Pesticides, Chlorinated.
Identifiers: *Rubidium, *Salton Sea, Teleosts, Sargo, Shad, Gulf croaker, Corvina, Gamma ray spectrometry, Flame photometry, Gulf of California, Lake Mead, Pile worm, Cesium radioisotopes, Neanthes succinea, Mugil cephalus, Dorosoma petenense, Anisotremus davidsoni, Bairdiella icistia, Cynoscion xantholus, Balanus amphitrite, Barnacles.

During 1967, a year long study was conducted on the distributions of the trace alkali metals cesium and rubidium, and of potassium, in the ecosystem of the Salton Sea. This quasi-marine environment provided the opportunity to study the behavior of these intracellular alkalies in a much simpler system than generally is found in the ocean. The dense phytoplankton populations growing in this agricultural sink, in conjunction with the zooplankton composed of only a few major species, produced a rich benthic organic mat. Two independent determinations of the concentration factors for cesium and potassium in muscle tissue of the Salton Sea teleosts were employed. These techniques were gamma-ray spectrometry for fallout Cs-137 and natural K-40, and flame photometry for stable cesium and potassium, and for rubidium. The results of these analyses indicated that there were no significant spatial or temporal changes in any of the water or biological concentrations measured in the Salton Sea that precluded the validity of year long averaging. There were no correlations with temperature changes. However, a comparison of the concentration factors in teleost specimens from the Salton Sea and the Gulf of California did imply that the potassium content of the water, rather than the cesium content, affected the concentration of cesium in the biota. (Mortland-Battelle)
W72-09574

TRACE ELEMENT CONCENTRATIONS IN SOME MODERN CORALS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.

W72-09577

THE ROLE OF THE U.S. GEOLOGICAL SURVEY IN WASTE DISPOSAL MONITORING,
Geological Survey, Washington, D.C. Water Resources Div.
J. T. Callahan.
Ground Water, Vol 10, No 3, p 6-9, May-June 1972.

Descriptors: *Monitoring, *Waste disposal wells, *Path of pollutants, Hydrogeology, Federal government, Injection wells, Water pollution control, Water pollution sources, Underground waste disposal, Waste storage, Research and development.

In recent years the constraints on the disposal of industrial and municipal wastes into rivers and the seas have prompted the disposal through wells into the subsurface. Limestone terrane is particularly amenable to the acceptance of all types of wastes in the cavernous subsurface, and this has resulted in widespread contamination of shallow groundwater resources. Highway salting has caused the contamination of thousands of household wells. Liquid wastes injected into the subsurface have not been disposed of, but rather have been placed in a new environment. They may be in storage, they may be attenuating, or they may be changing character by reaction with the rock mass or formation fluids. The U.S. Geological Survey has been concerned with the study of groundwater resources for more than 80 years, and with the problems of radioactive waste contamination since World War II. A new program investigates waste emplacement into the subsurface. The purpose of the program is to develop the ability to predict the fate of any wastes deliberately or accidentally emplaced in the subsurface. The program includes research contracts and grants with universities and governmental organizations as well as in-house research. (Knapp-USGS)
W72-09616

MIGRATION AND LEACHING OF METALS FROM OLD MINE TAILINGS DEPOSITS,
Idaho Univ., Moscow. Coll. of Mines.
J. H. Galbraith, R. E. Williams, and P. L. Siems.
Ground Water, Vol 10, No 3, p 33-44, May-June 1972. 8 fig, 7 tab, 6 ref. Bur. Mines Contract H0110088.

Descriptors: *Leaching, *Heavy metals, *Water pollution sources, *Path of pollutants, *Mine wastes, Idaho, Percolation, Acid bacteria, Sulfur bacteria, Iron bacteria, Acid mine water, Mine acids, Pyrite, Spoil banks, Waste dumps.
Identifiers: Mine tailings.

Leaching of heavy metals by groundwater passing through mine tailings is caused by the oxidation of sulfides through the action of microorganisms. The pH of the groundwater entering the tailings system is reduced by mechanisms within the tailings system itself. Action of sulfide-oxidizing and sulfur-oxidizing bacteria causes the formation of sulfuric acid, thereby increasing the acid and sulfate concentrations. Metal ions go into solution as metal sulfates. Four lines of evidence demonstrate the presence of microorganisms in the tailings system: (1) Fe-Mn concretions below the water table; (2) fixation of Na and K below the water table; (3) precipitation of sulfate salts on the surface; and (4) experiments on two sets of tailings samples, one from the surface which showed predominant aerobic activity and one from below the water table which showed predominant anaerobic activity. The combination of these mechanisms produces poor-quality groundwater. (Knapp-USGS)
W72-09620

BIOGEOCHEMICAL SOURCES OF IODINE AND COBALT IN MOLDAVIA (BIOGEOKHIMICHESKIYE PROVINTSII YODA I KOBALTA V MOLDAVII),
Kishinev Botanical Garden (USSR).
For primary bibliographic entry see Field 02K.
W72-09643

WATER POLLUTION AND PROBLEMS IN WATER TOXICOLOGY (ZAGRYAZNENIYE VOD I ZADACHI VODNOY TOKSIKOLOGII),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05C.
W72-09647

CONTAMINATION OF SURFACE AND GROUND WATER WITH PESTICIDES APPLIED TO COTTON,
North Carolina Water Resources Research Inst., Raleigh.
T. J. Sheets, J. R. Bradley, Jr., and M. D. Jackson.
Available from the National Technical Information Service as PB-210 148, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute Report No 60, April 1972. 63 p, 3 fig, 29 tab, 26 ref, append. OWRR A-040-NC (2).

Descriptors: *Pesticides, Leaching, *Path of pollutants, Water pollution sources, *Pesticide residues, *DDT, *Chlorinated hydrocarbon pesticides, Organophosphorus pesticides, Herbicides.
Identifiers: *Trifluralin, *Toxaphene, *Methyl parathion.

Of the total trifluralin, toxaphene, or methyl parathion applied to cotton plots, less than 1% was recovered in surface runoff. When DDT was applied alone, an average of 2.83% was present in runoff; whereas only about 1% of the DDT from a combination DDT plus toxaphene treatment was found in runoff. Of the DDT, trifluralin, toxaphene and methyl parathion recovered in runoff, 96, 84, 75, and 12%, respectively, was associated with the sediment fractions. Residues of trifluralin, DDT, and toxaphene persisted in soil from one season to the next. On a percent basis, trifluralin appeared to be more persistent than DDT and toxaphene. A much greater percentage of trifluralin, DDT, and toxaphene remained as residues in the soil than was found in runoff. A high percentage of the DDT, toxaphene, and methyl parathion was not recovered from runoff and soil. Residues of DDT in water from a small pond within one experimental watershed ranged from <0.35 ppb before spraying to 13.4 ppb during the spraying season. Toxaphene residues in pond water varied from <1 ppb before spraying to 65 ppb about mid season. Methyl parathion was detected in pond water for two sampling dates. The highest concentration of trifluralin in pond water (1.61 ppb) occurred during a heavy rain 5 days after application. None of the pesticides were detected in well water.
W72-09657

THE RELATIONSHIPS BETWEEN 32P ACCUMULATION IN ALGAE, BACTERIA AND TUBIFICIDS,
Western Michigan Univ., Kalamazoo, Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-09668

SUMMER CONFERENCE OF SOCIETY FOR APPLIED BACTERIOLOGY, LIVERPOOL, 13--15 JULY 1971,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 05C.
W72-09675

LABORATORY RELEASE RATE STUDIES OF DURSBAN-POLYMERIC FORMULATIONS, MARCH-JULY 1970,
Army Environmertal Hygiene Agency, Edgewood Arsenal,
L. L. Nelson.
Available from the National Technical Information Service as AD-732 422, $3.00 in paper copy, $0.95 in microfiche. Entomological Special Study No. 31-007-71/72, 4 p, 1 fig, 2 ref.

Descriptors: *Phosphothioate pesticides, *Plastics, *Larvicides, *Mosquitoes, Insecticides, Pesticide residues, Diptera, Chlorinated hydrocarbon pesticides, Gas chromatography.
Identifiers: *Dursban, O O diethyl O (3, 5, 6 - trichloro-2-pyridyl) phosphorothioate, Polyethylene, Polyvinyl chloride, Chlorinated polyethylene, Electron capture gas chromatography.

Polymer formulations were dosed at the rate of 500 mg of formulations per 3 liters. The emulsifiable concentrate (EC) was applied at the rate of 1 mg active ingredients per liter. Average residues determined over the test period was 0.2074 ppm for the 9.9 percent Dursban PE formulation, 0.0758 ppm for the 11.5 percent Dursban CPE formulation, and 0.0421 ppm for the 10 percent Dursban PVC formulation. Residues in the EC treatments declined from an initial concentration of 1.0 ppm to an average of 0.0309 ppm after 20 weeks. Results indicate that PE, CPE and PVC may be suitable carriers for Dursban for use as a mosquito larvicide and should be tested in the field. A gas chromatograph equipped with a nickel-63 electron capture detector was used for analyses of hexane extracts of Dursban. The retention time for Dursban relative to aldrin as unity was 0.89. (Jefferis-Battelle)
W72-09676

THE SANTA BARBARA OIL SPILL PART 1: INITIAL QUANTITIES AND DISTRIBUTION OF POLLUTANT CRUDE OIL,
California Univ., Santa Barbara, Dept. of Biological Sciences.
M. Foster, A. C. Charters, and M. Neushul.
Environmental Pollution, Vol. 2, p 97-113, 1971. 8 fig, 3 tab, 10 ref. FWPCA 14-12-516 NSF GB 5952 and GH 43.

Descriptors: *Offshore platforms, *Oil pollution, *Water pollution sources, *Oil spills, Drilling, Disasters, Oily water, Kelps.
Identifiers: *Santa Barbara (Calif).

The quantity of oil which came ashore during the early stages of the Santa Barbara oil spill has been estimated from intertidal oil samples and aerial photographs. These methods indicate that 4500 metric tons of crude oil were deposited on nearly 90 km of coast by 8 February 1969, 11 days after the spill began. Dosages in the intertidal zone varied from 2.7 to 118.1 metric tons/km. These dosage estimates suggest that the flow rate at the well was around 500 barrels (726 metric tons)/day during the early stages of the spill. A large quantity of oil was held for varying periods of time in the surface canopies of offshore kelp beds. The interaction of wind, wave action, tides, and substrate determined the pattern of oil distribution within the intertidal zone. (See also W72-09683) (LeGore-Washington)
W72-09682

THE SANTA BARBARA OIL SPILL PART 2: INITIAL EFFECTS ON INTERTIDAL AND KELP BED ORGANISMS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W72-09683

A SURVEY OF THE LEAD CONTENT OF FISH FROM 49 NEW YORK STATE WATERS,
New York State Coll. of Agriculture, Ithaca.
I. S. Pakkala, M. N. White, G. E. Burdick, E. J. Harris, and D. J. Lisk.
Pesticides Monitoring Journal, Vol. 5, No. 4, p 348-355, March 1972. 1 fig, 4 tab, 23 ref.

Descriptors: *Freshwater fish, *Lake trout, *Lead, *Public health, Water pollution effects, *New York, Heavy metals, Toxicity, Absorption.
Identifiers: *Lead content, Lead distribution, Game fish.

An alayatical survey was made of the total lead content of 419 fish of various species sampled in 1969 for 49 New York State waters and a group of lake trout sampled in 1970 from Cayuga Lake only. Most often, lead concentrations ranged from 0.3 to 1.5 ppm, but a few samples contained levels up to 3.0 ppm. Fishfrom certain waters including Lakes Canadice, Canadaigua, Erie, Hemlock, Pleasant, and Raquette and the Hudson River showed higher lead levels more consistently than fish from other waters. No correlation was noted between lead concentration and the size, species, or sex of fish, and lead did not appear to be cumulative in the lake trout of known age up to 12 years from Cayuga Lake. Considering the relatively insignificant portion of our diet that would normally comprise game fish, the residues of lead reported here would not appear to constitute a hazard. (Svensson-Washington)
W72-09715

ZINC RETENTION IN YOUNG RATS FED INCREASING LEVELS OF HIGH-ZINC OYSTERS,
Department of Natural Health and Welfare, Ottawa (Ontario). Food and Drug Research Lab.
For primary bibliographic entry see Field 05C.
W72-09716

HEAVY METALS IN UNITED STATES FISH,
Food and Drug Administration, Washington, D.C.
R. J. Ronk.
Transactions of the 36th North American Wildlife and Natural Resources Conference, March 7-10, 1971, p 133-138. 2 tab.

Descriptors: *Heavy metals, *Shellfish, *Monitoring, Water pollution effects, Water pollution, Zinc, Copper, Iron, Manganese, Lead, Cadmium, Chromium, Nickel, Cobalt, Surveys.
Identifiers: Seafood, *Shellfish sanitation, *Food and Drug Administration.

An overview of the extensive metals surveys being carried out by the Food and Drug Administration is presented. Included are some insights into how surveys of this type are built to provide the necessary data to strengthen consumer protection programs. The FDA will soon initiate a metals in fish surveys, which will include 12 metals: lead, arsenic, cadmium, selenium, chromium, cobalt, nickel, zinc, antimony, copper, tin and manganese. Bases for decision on which metals are selected are listed. The FDA National Shellfish Sanitation program is summarized as a program example. Modes of toxic action of metals and concentrating pathways are listed for the oyster. Trace metal levels in shellfish from Atlantic Coast waters are given. (Svensson-Washington)
W72-09719

POLYMER FORMULATIONS OF DURSBAN AND ABATE AS MOSQUITO LARVICIDES, APRIL - OCTOBER, 1970,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
L. W. Roberts, and T. A. Miller.
Available from the National Technical Information Service as AD-729 343, $3.00 in paper copy, $0.95 in microfiche. Entomological Special Study No. 31-006-71. 29 p, 11 fig, 1 tab, 6 ref, 5 app.

Descriptors: *Larvicides, *Mosquitoes, *Chemcontrol, Pesticides, Insecticides, Polymers.
Identifiers: *Abate, *Dursban, Polyethylene, Polyvinyl chloride, Culex spp.

Field tests were conducted to determine the larvicidal effectiveness of Dursban (0,0-diethyl 0-(3,5,6-trichloro-2-pyridyl) phosphorothioate) and Abate (0,0-dimethyl phosphorothioate 0,0-diester with 4,4'-thiodiphenol), each formulated as a slow-release polymer and as a water emulsion. Three types of plastic lined artificial pools were used to evaluate the formulations in three simulated habitats. The effectiveness of the formulations was monitored on a weekly basis by measuring naturally occurring populations of Culex pipiens quinquefasciatus and Culex restuans, by insecticide residues analysis of water samples collected from the pools, and by in-pool bioassay with 4th instar laboratory-reared larvae of C. pipiens quinquefasciatus. Although the Dursban CPE formulation (2.5 mg/l of 11.5% Dursban in chlorinated polyethylene) provided effective long-term control of mosquito larvae, it is not presently recommended for use in other than continued experimental work. Due to its ineffectiveness, the Abate PVC formulation (10 mg/l of 10% Abate in polyvinyl chloride) is not recommended for any use. (LeGore-Washington)
W72-09720

EFFECTS OF POLYMER FORMULATIONS OF DURSBAN AND ABATE ON NON-TARGET ORGANISM POPULATIONS, APRIL - OCTOBER, 1970,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05C.
W72-09721

MATHEMATICAL MODELS FOR THE PREDICTION OF THERMAL ENERGY CHANGES IN IMPOUNDMENTS.
Water Resources Engineers, Inc., Walnut Creek, Calif.

Copy available from GPO Sup Doc, $1.50; microfiche from NTIS as PB-210 126, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1969. 182 p, 40 fig, 4 tab, 27 ref. EPA Program 16130 EXT 12/69.

Descriptors: *Reservoirs, *Water temperature, *Mathematical models, Thermal stratification, Heat budget, Computer programs, Impoundments, Columbia River, Diffusion, *Forecasting, *Model studies, Thermal pollution, Washington.
Identifiers: *Temperature prediction, *Lake Roosevelt (Wash).

A previous mathematical model was refined to enable it to describe the thermal regime of a stratified reservoir under various hydrologic, meteorologic, and hydraulic conditions. Refinements included a generalized empirical expression for the eddy conductivity coefficient, and allowance for the influence of reservoir stability on the vertical extension of the withdrawal zone for reservoir outlets and the zone of influence for inflows. The refined model accounts for external heat exchange by the usual heat budget components. Internal heat transfer is accomplished by the penetration of short-wave radiation, eddy diffusion, and vertical advection. The model was tested and verified on Hungry Horse Reservoir and is applicable on reservoirs for which the assumption of horizontal isotherms is valid. A method for testing this assumption is given. The model described above was extended to simulate weakly stratified reservoirs (tilted isotherms). The weakly stratified reservoir is represented as a series of smaller reservoirs that are coupled to one another by heat and mass continuity. A test of the segmented model on Lake Roosevelt gave satisfactory results; however, its general applicability remains to be established. (Eagle-Vanderbilt)
W72-09727

RESEARCH ON THE PHYSICAL ASPECTS OF THERMAL POLLUTION.
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

Copy available from GPO Sup Doc, $1.75; microfiche from NTIS as PB-210 124, $0.95. Environmental Protection Agency Water Pollution Control Research Series, February 1971. 188 p, 53 fig, 3 tab, 82 ref. EPA Program 16130 DPU 02/71.

Descriptors: *Thermal stratification, *Thermal pollution, *Path of pollutants, Lakes, *Water temperature, Mathematical models, Thermocline, Hydrodynamics, Diffusion, Laboratory tests, Thermal powerplants, *Forecasting, Mixing, *Model studies, New York.
Identifiers: *Water temperature forecasting, Interfacial mixing, *Cayuga Lake (N.Y.).

The mechanisms of formation and maintenance of the characteristic thermal structure of deep, temperate lakes are investigated along with the effects on that thermal structure of heat discharges from electric generating plants. Thermoclines develop because of nonlinear interaction between surface turbulence and buoyancy gradients from surface heating. A theoretical model including the interaction of those factors predicts the observed features of stratification accurately. Thermal discharges increase the temperature to a different degree at different levels of the entire lake. Discharges also increase the depth of the thermocline and lengthen the stratification period. An exploratory experimental study is described on the nature of the interfacial mixing between a flowing layer of warm water and an underlying cooler pool of water. The downward transfer of both momentum and heat are severely inhibited at the interface by the stable buoyancy gradients; momentum to a lesser degree. (Eagle-Vanderbilt)
W72-09728

AN ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF SURFACE DISCHARGES OF HEATED WATER,
Masssachusetts Inst. of Tech., Cambridge. Water Resources and Hydrodynamics Lab.
K. D. Stolzenbach, and D. R. F. Harleman.
Copy available from GPO Sup Doc, $1.75; microfiche from NTIS as PB-210 134, $0.95. Environmental Protection Agency Water Pollution Control Research Series, February 1971. 212 p, 47 fig, 5 tab, 38 ref. EPA Program 16130 DJU 02/71.

Descriptors: *Thermal pollution, *Heated water, Turbulence, Electric powerplants, Mathematical models, *Model studies, Buoyancy, Heat balance, *Discharge (Water), *Water temperature, Forecasting.
Identifiers: *Temperature prediction, Surface discharges, Buoyant jets.

The prediction of temperature within the region dominated by turbulence from a heated discharge was investigated. A three-dimensional theory is developed, based on a turbulent jet model and including density gradients and surface heat loss. Of interest in formulating the theory is the dependence of the temperature distribution in the receiving water on the temperature difference between discharge and ambient water, the initial discharge velocity, the channel geometry, the bottom slope, the ambient cross flow, and surface heat transfer. Experiments are performed in a laboratory basin in which all of thhe relevant parameters, including cross flow and bottom slope, are varied and temperatures are measured in the heated discharge. The experiments verify the theoretical predictions. The theory contains no undetermined parameters and the comparison of the experimental and theoretical results does not involve any fitting of the theory to data. The rate of temperature decrease in the jet and the vertical and lateral spreading are controlled by the initial densimetric Froude number, the ratio of channel depth to width, and the bottom slope. A cross flow deflects the jet but does not greatly affect the temperature distribution. (Eagle-Vanderbilt)
W72-09729

METHODS FOR EVALUATING EFFECTS OF TRANSIENT CONDITIONS IN HEAVILY LOADED AND EXTENSIVELY REGULATED STREAMS,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Lab.
R. T. Jaske, W. L. Templeton, and C. C. Coutant.
Presented at ASME/AICHE Stream Pollution Abatement Conference, 'The River a Biological

Reactor', Rutgers University, New Brunswick, New Jersey, June 10-12, 1969. 33 p, 16 fig, 1 tab, 13 ref. AEC AT (45-1)-1830.

Descriptors: *Thermal pollution, *Remote sensing, *Fish, Mathematical models, Cooling water, Dye releases, Water temperature, Outlets, Mortality, Model studies, *Water pollution effects, *Mixing, Dispersion, *Columbia River (Wash), Washington.
Identifiers: Hanford reactor, Mixing zone.

The state of the art in the areas of zone of prompt mixing, the transition zone and the mixed zone is used to evaluate the interaction of the effluent releases from the Hanford nuclear reactors with the highly regulated regime of Columbia River. Significant developments in the use of infrared imagery, high speed photography, radar and improved electronics are discussed. The maximum temperature exposure would occur to fish which enter the mixing eddies in deep water near the outlet pipe and are carried through the highest temperature region. An equation describing the rate of change of internal fish temperature at a given depth is given. An expression relating the rate of mortification to fish temperature (at the depth of occurrence) is also given. The model has been tested against several hypothetical thermal plumes to which groups of coho juveniles were exposed and acceptable correspondence was obtained. (Upadhyaya-Vanderbilt)
W72-09731

THE DISSIPATION OF HEAT FROM THERMAL DISCHARGES,
Johns Hopkins Univ., Baltimore, Md.
D. K. Brady.
April 1970. 5 p, 2 fig, 1 tab, 22 ref.

Descriptors: *Thermal pollution, *Heat budget, Electric power, Dew point, Froude number, Computer models, Evaporation, Cooling, Temperature, *Discharge (Water), Evaporation.
Identifiers: Thermal discharge, *Heat dissipation, Cooling lakes, Equilibrium temperature, Exchange coefficient.

Thermal discharges are likely to increase in both number and size during the next few decades. Man's thermal impact on earth is negligible. Although back radiation plays a predominant role in keeping earth's water cool, the key factor in determining additional heat assimilative capacity is evaporation. At night, water tends to seek the dewpoint temperature, but solar radiation, Hs, raises the equilibrium temperature by an increment of Hs/K, where K is the heat exchange coefficient. A design chart for K in terms of the windspeed, dewpoint and water surface temperature is given. The rapid decay of excess temperature generally observed near the thermal discharges into open waters is largely due to dilution, not surface cooling. Laboratory experiments with buoyant jets show fair agreement with prototype performance, but need more study. Hydraulic simulation by computer needs more development to compete with hydraulic modeling in the near future. (Upadhyaya-Vanderbilt)
W72-09732

POTENTIAL USES OF WASTE WATERS AND HEATED EFFLUENTS,
Food and Agriculture Organization of the United Nations, Rome (Italy). Inland Fishery Resources Branch.
A. E. Thorslund.
European Inland Fisheries Advisory Commission, Occasional Paper No. 5, 1971. 23 p, 8 fig, 3 tab, 22 ref.

Descriptors: *Fisheries, *Heated water, *Aquatic productivity, *Wastes, Fish harvest, Fish management, Carp, Thermal powerplants, *Thermal pollution, Water pollution, Sewage effluent, Aquatic plants, *Water utilization.
Identifiers: *Poland.

In Poland carp were cultivated in the undiluted effluent from an activated sludge plant, throughout a full year. Two-year-old carp have lower oxygen requirements than carp fry, enabling them to live in ponds with overflow. Fish yields over 1000 kg per ha were obtained without supplemental feeding. Experiments were also run with carp in ponds containing diluted sugar beet factory waste. A yearly cycle is possible with wastes collected and stored during autumn and winter, diluted in the spring and led to ponds. Before winter the ponds were emptied into small rivers without causing pollution problems. Fish production was comparable to that obtained with chemical fertilization. Detailed investigations were carried out on the effects of heated effluents from two thermoelectric plants on a system of five interconnected lakes. Temperature and oxygen measurements and population studies of aquatic plants and fish were made. The growth rate increased for all species while the fertility increased for some species and decreased for others. Eutrophication has been turned into fish production through higher growth rates and introduction of eels and several varieties of carp. (Eagle-Vanderbilt)
W72-09733

HEAT DISSIPATION AT POWER PLANT COOLING LAKES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography; and Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 02D.
W72-09736

HAZELWOOD POWER STATION - DATA COLLECTION AND ANALYSIS OF COOLING POND PERFORMANCE,
State Electricity Commission of Victoria, (Australia). Hydrology, Civil and Architectural Dept.
For primary bibliographic entry see Field 05D.
W72-09737

AIR COOLING FOR CONDENSATION AND EXHAUST HEAT REJECTION IN LARGE GENERATING STATIONS,
Maschinenfabrik Augsburg-Nuernberg A.G., Nuremberg (West Germany).
For primary bibliographic entry see Field 05D.
W72-09738

5C. Effects of Pollution

POSSIBLE DDT MORTALITY IN YOUNG RAINBOW TROUT,
Otago Univ., Dunedin (New Zealand). Medical School.
J. C. Dacre, and D. Scott.
N Z J Mar Freshwater Res. 5 (1): 58-65. 1971.

Descriptors: *DDT, *Mortality, *Rainbow trout, *Water pollution effects, *Fishkill, *Insecticides, Toxicity.

An unusually high mortality of eggs and fry of rainbow trout (Salmo gairdneri Richardson) from Lake Taupo in 1966 was possibly caused by excessive exposure to DDT and its metabolites. The egg and fry mortality (44.6%), and DDT level in the fry (4.63 ppm), were compared with other similar cases of possible DDT poisoning in young salmonids, both in New Zealand and North America. Other possible adverse effects on young salmonids exposed to DDT were discussed.--Copyright (c) 1972, Biological Abstracts, Inc.
W72-09141

QUALITY OF EFFLUENT FROM SWINE PRODUCTION AREAS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 05B.
W72-09151

INFECTIOUS PANCREATIC NECROSIS VIRUS: COMPARATIVE FREQUENCIES OF ISOLATION FROM FECES AND ORGANS OF BROOK TROUT (SALVELINUS FONTINALIS),
Guelph Univ. (Ontario). Dept. of Veterinary Microbiology and Immunology.
For primary bibliographic entry see Field 05A.
W72-09152

CHLORINATED MUNICIPAL WASTE TOXICITIES TO RAINBOW TROUT AND FATHEAD MINNOWS.
Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management.

Copy available from GPO Sup Doc as PB-209 890. Environmental Protection Agency, Research and Monitoring, Water Pollution Control Research Series, October 1971. 49 p. 9 fig, 13 tab, 26 ref, 8 append. EPA Project 18050 GZZ 10/71.

Descriptors: *Water pollution sources, *Chlorination, *Fish, *Toxicity, Rainbow trout, Sewage treatment, Michigan, Chlorine, Lethal limit, Aquatic life, Mortality, Water quality.
Identifiers: *Chlorinated municipal wastes, Pimephales promelas.

Effect of chlorinated municipal wastes on fish life and laboratory findings of earlier researchers were assessed in separate studies at four Michigan municipal wastewater treatment plants. Tolerance levels and river length below each plant outfall rendered unavailable to resident fish populations were determined. Chlorine in municipal wastewater discharges is usually present in combined form with ammonia, ammonium hydroxide or ammonium ions to form mono-, di-, or trichloramine. Ten rainbow trout (Salmo gairdneri) and ten fathead minnows (Pimephales promelas), previously acclimated, were held 96 hours in live boxes in the stream above and below these outfalls. Fish held below these outfalls were subjected to both chlorinated and non-chlorinated exposures during effluent discharge. Test waters were monitored chemically and bacteriologically during fish exposure. Total residual chlorine concentrations below three plants were toxic to rainbow trout at distances up to 0.8 mile. Fathead minnows appeared adversely affected up to 0.6 mile downstream in two of the four plants. Total residual chlorine concentrations less than 0.1 mg/l were toxic to fathead minnows. Rainbow trout 96-hour total residual chlorine TL-50 concentration below two plants was 0.023 mg/l. (Jones-Wisconsin)
W72-09154

NUTRIENTS AND EUTROPHICATION: THE LIMITING NUTRIENT CONTROVERSY.

American Society of Limnology and Oceanography Special Symposia, Vol I, Allen Press, Lawrence, Kansas, 1972. 328 p. OWRR X-109 (No. 3415) (1).

Descriptors: *Eutrophication, *Carbon, *Phosphorus, Nitrogen, Algae.
Identifiers: *Limiting nutrients.

The intent of the American Society of Limnology and Oceanography to provide an open forum for communication between academe, state and federal agencies, and industry, culminated in this symposium held at W. K. Kellogg Biological Station of Michigan State University on February 11-12, 1971. It was the hope to provide a clear statement of current ideas relative to the importance of various regulating or limiting nutrients in the eutrophication of aquatic ecosystems. Only one factor--nutrient availability--was selected as the subject. The focus was on the relative importance of carbon and phosphorus in regulating eutrophication. Because of the recent carbon vs. phosphorus controversy (centered on the proposal that carbon rather than phosphorus or nitrogen limits algal productivity) this subject carries political and economic overtones. Since phosphorus in

detergents is linked to cultural eutrophication, the controversy is now emotionally charged following legislative proposals to remove phosphorus from detergent formulations. The proceedings of this symposium where ideas and data were openly and authoritatively discussed, questioned, and debated, are intended to provide the public and politicians with some useful guidelines to this problem. It is up to each reader to evaluate the controversy and to determine whether there was one. (See W72-09156 thru W72-09172) (Auen-Wisconsin)
W72-09155

EUTROPHICATION AND AQUATIC ECOSYSTEMS,
Cornell Univ., Ithaca, N. Y. Div. of Biological Sciences.
E. Likens.
In: Nutrients and eutrophication: The limiting nutrient controversy, p 3-13, 2 fig, 51 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Eutrophication, *Ecosystems, Model studies, Organic matter, Aquatic productivity, Primary productivity, Input-output analysis, Cycling nutrients.

The ecosystem concept as applied to analysis of eutrophication of aquatic ecosystems is discussed. In defining boundaries of an ecosystem lateral boundaries of a functional lake are delimited by the shoreline, and vertical boundaries are the water surface and the maximum sediment depth utilized by organisms. The continuous nutrient flow across these boundaries are categorized into meteorologic, geologic, and biologic inputs and outputs. A model is proposed for simplifying, categorizing, and quantifying the complex linkages between ecosystems, and between ecosystems and the biosphere. The model used extensively for nutrient cycling can easily be expanded to include energy flux. Organic matter inputs may originate from autochthonous and allochtponous sources. Autochthonous inputs include carbon fixed by phytoplankton, macrophytes, periphyton, and chemosynthetic microorganisms. Inputs of reduced carbon from the watershed may be carried to the lake by meteorologic, geologic, and biologic systems. Measurement of all inputs may be important in evaluating eutrophication. In analysis of eutrophication patterns and causes ecosystem function should be observed. The ecosystem concept, coupled with an understanding of nutrient and energy fluxes, provides a sound theoretical basis for management and regulation of freshwater resources. (See also W72-09155) (Jones-Wisconsin)
W72-09156

BIOGEOCHEMISTRY OF LAKES: MAJOR SUBSTANCES,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
E. S. Deevey, Jr.
In: Nutrients and eutrophication: The limiting nutrient controversy, p 14-20, 2 fig, 3 tab, 29 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1971.

Descriptors: *Lakes, *Biochemistry, *Chemical properties, *Geochemistry, Dissolved solids, Productivity, Ion transport, Phosphorus, Cycling nutrients, Carbon cycle, Bicarbonates, Nitrogen, Sulfur, Eutrophication.
Identifiers: *Limiting nutrients, *Atmospheric transport.

Stressing recent atmospheric transport measurements such as those at Hubbard Brook, New Hampshire, major dissolved substances in lake waters are reviewed. By this little-noticed mechanism, substantial amounts of cations reach lakes along with larger but less unexpected amounts of anions. Phosphorus, the only essential biological element that seems not to be significantly transported through the atmosphere, is normally rockbound but is currently being provided in surplus as a pollutant. To the extent that lithology controls or regulates production in aquatic systems, phosphorus is the scarcest and, therefore, the critical component of that control. When phosphorus is in surplus other elements can act at least locally or temporarily as production regulators. With this under consideration, the carbon cycle in natural waters is briefly explored. In waters of very moderate hardness, the carbon supply, as bicarbonate, is normally in excess of the phosphorus supply. As one result, remarkably uniform quantities of fixed carbon (3 mg or more per square cm/year) are exported to sediments and permanently buried. Limitation of production by carbon, though imaginable in sewage oxidation ponds or in very soft water seems an unlikely problem in the near future. (See also W72-09155) (Jones-Wisconsin)
W72-09157

THE ROLE OF MINOR NUTRIENTS IN LIMITING THE PRODUCTIVITY OF AQUATIC ECOSYSTEMS,
California Univ., Davis. Div. of Environmental Studies.
C. R. Goldman.
In: Nutrients and eutrophication: The limiting nutrient controversy, p 21-38, 8 fig, 3 tab, 29 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Nutrients, *Productivity, *Aquatic environment, *Limiting factors, *Trace elements, Oligotrophy, Eutrophication, Methodology, Molybdemum, Measurement, Cycling nutrients, Model studies.
Identifiers: *Limiting nutrients, Castle Lake (Calif), Autoradiography, Lake Tahoe (Calif).

The limiting-factor concept is useful in understanding dynamics of aquatic ecosystems but it is almost certainly an oversimplification when applied to the organisms representing natural phytoplankton populations. Trace elements, either singly or in combination, may limit aquatic environment productivity. Of methods for determining nutrient-limiting factors, one measures nutrient content of the waters and infers limitation of specific nutrients that are in short supply. Another collects the organisms themselves, extracts and analyzes their cell content; a third adds nutrients to the natural phytoplankton population and measures their growth responses; a fourth is similar to the third except that a test species is used in filtered water for the bioassay. Trace element deficiencies are more likely in oligotrophic than in eutrophic lakes. In Castle Lake, California which is deficient in molybdenum, nitrogen-fixing alders appear to compete with aquatic ecosystem for molybdenum. Algal enzyme systems are simultaneously limited by more than a single nutrient. The additive effect of phosphate additions to iron- and nitrogen-limited Lake Tahoe, California is emphasized. Autoradiography is useful in determining relative metabolic activity. To understand lakes submodels that emphasize recycling time and efficiency are recommended as opposed to models requiring masses of data. (See also W72-09155) (Jones-Wisconsin)
W72-09158

THE INTERRELATION OF CARBON AND PHOSPHORUS IN REGULATING HETEROTROPHIC AND AUTOTROPHIC POPULATIONS IN AN AQUATIC ECOSYSTEM, SHRINER'S POND,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
P. C. Kerr, D. L. Brockway, D. F. Paris, and J. T. Barnett, Jr.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 41-62, 9 fig, 58 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Carbon, *Phosphorus, *Population, Aquatic environment, Ecosystems, Georgia, Biorthythms, Laboratory tests, Algae, Carbon dioxide, Cycling nutrients, Bicarbonates, Plant growth, Durnal.
Identifiers: *Limiting nutrients, Potassium chloride, Shriner's Pond (Ga).

Any of the types of biological regulation--physical, chemical, genetic, and nutritional--can regulate biological activity of organisms at different times and places. Shriner's pond, Georgia w studied to ascertain chemical and biological changes associated with addition of nitrogen and phosphorus or carbon dioxide. Within 12 hours after reagent-grade nitrogen, phosphorus, and potassium chloride were added, the bacterial population increased. Algal population increased 36-48 hours after fertilization. Diel cycling of carbon dioxide and bicarbonate was measured. Although these data do not clearly indicate that increased availability of inorganic carbon was responsible for initiation of algal growth, continued biological production of carbon dioxide appeared to prolong the bloom duration. Data indicate more nitrogen and phosphorus were removed during night than during day; the higher removal was associated with oxygen removal, decreasing pH, and accumulation of carbon dioxide and bicarbonate, indicating heterotrophic activity. Carbon dioxide was removed and bicarbonate was depleted from the water during light hours. Algal growth was stimulated by bubbling 5% and 0.03% carbon dioxide in air through water. These experiments indicate importance of carbon in regulating algal growth. (See also W72-09155) (Jones-Wisconsin)
W72-09159

PHYTOPLANKTON PHOTOSYNTHESIS, MICRONUTRIENT INTERACTIONS, AND INORGANIC CARBON AVAILABILITY IN A SOFT-WATER VERMONT LAKE,
Dartmouth Coll. Hanover, N.H. Dept. of Biological Sciences.
H. L. Allen.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 63-83, 13 fig, 3 tab, 30 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Phytoplankton, *Photosynthesis, *Nutrients, Microorganisms, Inorganic compounds, Carbon, Vermont, Lakes, Hardness (Water), Carbon cycle, Trace elements, Chemical properties, Measurement, Methodology, Bioassays, Model studies, Analytical techniques.
Identifiers: *Limiting nutrients, Star Lake (Vt), Micronutrients, Soft water lakes, Inorganic-organic carbon.

Most New England lakes are 'soft-water,' with low ionic concentration and low alkalinities. Resulting from low alkalinities, the waters are inadequately buffered and often respond to intensive phytoplankton photosynthesis by abrupt pH increase. A small, eutrophic, soft-water Vermont lake was investigated to evaluate inorganic-organic carbon relationships in phytoplankton photosynthesis. The standard C-14 technique was modified by adding both carbon-dioxide-14 and mixtures of bicarbonate-14 and carbonate-14 to in situ phytoplankton and higher aquatic plants. Simultaneous measurements were made of primary production and extracellular release of C-14 labeled dissolved organic compounds. Bioassays were conducted dependent on relative C-14 uptake during photosynthesis. A technique was developed for measuring C-14 dioxide uptake over short time intervals; inorganic carbon uptake followed first-order kinetics. Nannoplanktonic algae were incapable of using bicarbonate as a carbonsource during periods of high pH. Labeling experiments with natural algae, bacteria, and high aquatic

plants suggest that open-water bacterial respiration provided carbon dioxide for the high and sustained rates of algal photosynthesis during periods of high pH and low inorganic carbon availability; also higher aquatic plants in littoral zone supplied extracellular carbon compounds used by planktonic algae and bacteria. Three theoretical models are described. (See also W72-09155) (Jones-Wisconsin)
W72-09160

THE ROLE OF CARBON IN HARD-WATER MARL LAKES,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
R. G. Wetzel.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 84-97, 22 fig, 4 tab, 29 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Carbon, *Hardness (Water), *Marl, *Lakes, Nutrients, Photosynthesis, Carbon cycle, Metabolism, Productivity, Alkalinity, Chemical reactions, Limiting factors, Primary productivity.
Identifiers: *Limiting nutrients, *Marl lakes, Lawrence Lake (Mich).

In 25% to a majority of southern Michigan lakes ionic composition is completely dominated by bicarbonate and all are considered hard-water marl lakes. Particulate and colloidal calcium carbonate occurs in high concentrations. Concentrations of phosphorus, iron, manganese, and similar ions are extremely low and exert major influences on carbon cycling. Organic and inorganic nitrogen concentrations usually occur at very high levels. Some major interactions influencing rates of biotic carbon cycling of such lakes are demonstrated. Primary production rates of phytoplankton were determined weekly in situ with C-14 light and dark techniques. Nutrient limitations to photosynthesis and carbon cycling in hard-water lakes exist as a number of simultaneous organic and inorganic interactions that cannot be treated separately. Natural amino compounds of moderate complexing capacity exhibited excellent properties of increasing availability of metals for algal utilization. Analyses of iron availability and responses of algal metabolism to iron as regulated by dissolved organic compounds demonstrate importance of organic complexing mechanisms to photosynthetic productivity. Particulate and colloidal calcium carbonate can function significantly in inactivating certain labile organic compounds, reducing bacterial metabolism and attendant inorganic and organic regeneration, and controlling inorganic carbon dissociation from the carbonate-organic complex. (See also W72-09155) (Jones-Wisconsin)
W72-09161

CARBON LIMITATION IN SEWAGE LAGOONS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
D. L. King.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 98-110, 8 fig, 16 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Carbon, *Sewage lagoons, *Limiting factors, Algae, Productivity, Photosynthesis, Nutrients, Eutrophication, Cyanophyta, Alkalinity, Diurnal, Nitrogen.
Identifiers: *Limiting nutrients.

Observations of sewage lagoons offer significant insight into the processes involved in lake eutrophication. It is concluded that both the qualitative and quantitative aspects of eutrophication must be considered. Additions of required algal nutrients to a lake allow increases in quantity of algae and can strain the carbon availability to the point where there is also a change in algal quality. Establishment of summer blue-green algal blooms usually is of greater concern than the precursory increase in quantity of the more desirable algal forms. Calculations suggest that amounts of algal nutrients, other than carbon, required to promote summer blooms of blue-green algae are determined by alkalinity of the water in question. Attempts to control eutrophication by limiting just carbon availability probably would result in establishment of blue-green algae dominance but perhaps in lower quantities. The blue-green algae probably would accelerate and rate of carbon dioxide gain from the atmosphere. Attempts to limit available nitrogen may result in establishment of blooms blue-greens which can fix atmospheric nitrogen. Limitation of phosphorus appears to offer the best chance of controlling both qualitative and quantitative aspects of eutrophication. (See also W72-09155) (Jones-Wisconsin)
W72-09162

CHARACTERIZATION OF PHOSPHORUS--LIMITED PLANKTON ALGAE,
New York State Dept. of Health, Albany. Environmental Health Center.
G. W. Fuhs, S. D. Demmerle, E. Canelli, and M. Chen.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 113-133, 16 fig, 3 tab, 59 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Phosphorus, *Plankton, *Algae, *Limiting factors, Growth rates, Diatoms, Bacteria, Lakes, Nitrogen, Analytical techniques, Carbon, Eutrophication, Standing crops, Laboratory tests, Chemical analysis, Bioassay, Cytological studies, Nutrients, Enzymes.
Identifiers: *Limiting nutrients, Canadarago Lake (NY), Lake George (NY).

Growth rate of microorganisms as a function of concentration of phosphorus source is calculated from continuous culture and phosphorus uptake experiments. For two diatoms and three bacteria, values of the minimum phosphorus content, growth rate with phosphorus nonlimiting, the Michaelis constant, and rate for uptake of the phosphorus source are given. Phosphorus content or organisms depends on protoplasma volume although maximum growth rates vary widely. Maximum uptake rates per unit area of cell surface are similar. Bacteria with more favorable surface-to-volume ratio may outgrow algae even though they show lower affinity toward orthophosphate. Phosphorus-limited diatoms show increases in mean cell volume, cell carbon, refractility of cells, and alkaline phosphatase content, whereas cell nitrogen and cell protein decrease. The carbon:phosphorus atomic ratio reflects availability of phosphorus and, although less dramatically, so does the nitrogen:phosphorus ratio. These ratios are important in detecting nutrient limitation. For preservation of Canadarago Lake and Lake George, New York feasibility of removing limiting or near-limiting elements from tributary waters should be considered. Kinetic models and measurement of species constants under laboratory and field conditions are required for prediction of short-term changes and turnover of lake biomass. (See also W72-09155) (Jones-Wisconsin)
W72-09163

ALGAL RESPONSES TO NUTRIENT ADDITIONS IN NATURAL WATERS. I. LABORATORY ASSAYS,
Environmental Protection Agency, Corvallis, Oreg.
T. E. Maloney, W. E. Miller, and T. Shiroyama.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 134-140, 12 fig, 2 tab, 8 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Algae, *Nutrients, *Laboratory tests, *Bioassay, Oregon, Lakes, Nitrogen, Phosphorus, Carbon, Growth rates, Oligotrophy, Eutrophication.
Identifiers: *Limiting nutrients.

In the fall of 1970 waters of nine Oregon lakes of varying water quality were studied in a series of laboratory algal assays on a quarterly basis to determine effects of seasonal changes and of water chemistry upon algal growth and to evaluate potential effects on algal growth of various nutrient additions. Selanastrum capricornutum was used as the test species. Additions of nitrogen, phosphorus, and carbon, singly and in combination, were made to the waters and algal growth rates were determined. In four of the waters addition of phosphorus alone greatly stimulated algal growth and in two of the lake waters addition of nitrogen alone slightly stimulated algal growth rates. Three of the test waters were capable of supporting relatively high algal growth rates without nutrient additions, and in one highly oligotrophic lake water the addition of nitrogen, phosphorus, and carbon had no effect on algal growth rates. In all cases algal growth rates were directly proportional to the amounts of dissolved phosphorus in the waters, but there was no obvious correlation between algal growth rates and concentrations of nitrogen and carbon. (See also W72-09155) (Jones-Wisconsin)
W72-09164

ALGAL RESPONSES TO NUTRIENT ADDITIONS IN NATURAL WATERS. II. FIELD EXPERIMENTS,
Pacific Northwest Water Lab., Corvallis, Oreg.; and Shagawa Lake Eutrophication Control Project, Ely, Minn.
C. F. Powers, D. W. Schults, K. W. Malueg, R. M. Brice, and M. D. Schuldt.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 141-156, 9 fig, 5 tab, 6 ref. American Society of Limnology and Oceanography Special Symposia, Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Eutrophication, *On-site tests, *Nutrients, Algae, Lakes, Phosphorus, Carbon, Nitrogen.
Identifiers: *Limiting nutrients, Shagawa Lake (Minn), Waldo Lake (Ore).

Results of the in situ assay experiments have some definite implications applicable to eutrophication and lake restoration. While eutrophic Shagawa Lake, Minnesota receives about 80% of low nutrient content and excellent quality water from Burntside River about 70% of the total phosphorus and 25% of the total nitrogen originates from discharges of the Ely municipal waste treatment plant. Neither phosphorus nor nitrogen alone stimulated algal growth in Burntside water; carbon likewise had no positive effect. All dissolved materials were present in extremely low concentrations in pristine Waldo Lake, Oregon; a positive response to phosphorus enrichment on three of the four testing dates indicated that increasing rates of producitivity might rapidly result from relatively small additions of this obviously critical element. At no time did this lake respond to additions of either nitrogen or carbon. Tests at moderately productive Triangle Lake, Oregon and eutrophic Cline's Pond showed variable reactions to nutrient enrichment serving to point up the importance of numerous observations over different seasons. Frequently more than one nutrient element appears to be limiting phytoplankton at the same time. Even though positive growth response occasionally followed additions of other nutrients, phosphorus was the most frequently limiting. (See also W72-09155) (Auen-Wisconsin)
W72-09165

PHOSPHORUS, SILICA, AND EUTROPHICATION OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.

C. L. Schelske, and E. F. Stoermer.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 157-171, 7 fig, 6 tab, 19 ref. American Society of Limnology and Oceanography Special Symposia Vol 1, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Phosphorus, *Silica, *Eutrophication, *Lake Michigan, Phytoplankton, Measurement, Nitrogen, Carbon, Diatoms, Photosynthesis, Chemical properties.
Identifiers: *Limiting nutrients.

There are three methods of determining limiting nutrients in Lake Michigan: chemical assay, in which chemical environmental characteristics are measured and used to deduce why phytoplankton grow and reproduce; biological assay, in which pure cultures with known growth requirements are used in formulating questions about the trophic state; and ecological perturbation experiments combining features of the first two. Balances of material are measured, several effects related to eutrophication demonstrated and natural phytoplankton populations utilized under conditions simulating Lake Michigan. Natural phytoplankton assemblages enclosed in large plastic bags responded, measured by C-14 uptake and cell counts, to experimental treatments of nitrogen, phosphorus, and silica; nitrogen and phosphorus; and phosphorus alone. Cell number increase and carbon fixation rates were accompanied by decreases in soluble nitrate and silicate and increases in particulate phosphates, indicating biological utilization of these elements. Silica was reduced to limiting levels but not nitrogen. A highly significant correlation occurred between carbon fixation rate and particulate phosphorus. These data indicate that phosphorus has been the limiting nutrient controlling eutrophication, resulting in lower silica concentrations. With continued silica depletion, diatoms will be replaced by nonsiliceous forms, probably blue-green and green algae. (See also W72-09155) (Jones-Wisconsin)
W72-09166

NUTRIENTS AND PHYTOPLANKTON IN LAKE WASHINGTON,
Washington Univ., Seattle. Dept. of Zoology.
W. T. Edmondson.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 172-193, 8 fig, 3 tab, 34 ref. American Society of Limnology and Oceanography Special Symposia Vol 1, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Nutrients, *Phytoplankton, Water pollution effects, Eutrophication, Productivity, Algae, Phosphates, Nitrogen, Sewage, Carbon dioxide, Seasonal, Phosphorus, Water pollution sources, Biochemical oxygen demand, Water pollution control, Nitrates, Effluents, Detergents, Sodium chloride, Chemical properties, Secchi disks, Methodology.
Identifiers: *Limiting nutrients, *Lake Washington (Wash).

Lake Washington received increasing amounts of raw sewage until a diversion system to Puget Sound was completed about 1963. Information about the lake's changes pertinent to the relative importance of different elements in control of productivity in natural lakes is summarized. Resulting from enrichment (1941 to 1963) due to effluent from secondary sewage treatment plants, production and abundance of algae increased several fold. The winter phosphate concentration increased proportionally much more than did nitrate or carbon dioxide. After diversion, by 1969, winter phosphate decreased to 28% of its 1963 value, summer chlorophyll concentrations decreased about as much, but nitrate and carbon dioxide fluctuated year to year at relatively high values. Thus phosphorus and phytoplankton showed the major change, not nitrate or carbon dioxide. Similarly at summer's end, phosphate concentration in hypolimnion changed more than did nitrate and carbon dioxide. This is consistent with secondary effluent, which contains more phosphorus than nitrogen or carbon. The biological oxygen demand of effluents reaching the hypolimnion is small relative to observed changes in hypolimnetic oxygen. Phytoplankton was not appreciably changed by a small salt water invasion. Effectiveness of a given phosphate supply may be affected by nitrate. (See also W72-09155) (Jones-Wisconsin)
W72-09167

NATURAL CARBON SOURCES, RATES OF REPLENISHMENT, AND ALGAL GROWTH,
WARF Inst., Inc., Madison, Wis.
S. D. Morton, R. Sernau, and P. H. Derse.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 197-204, 2 fig, 3 tab, 15 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Carbon, *Algae, *Eutrophication, *Growth rates, Chlorella, Carbon dioxide, Bicarbonates, Algal control, Aeration.
Identifiers: *Limiting nutrients, Anabaena, Carbon sources.

In research originally undertaken to determine whether eutrophication in small areas could be controlled by sweeping carbon dioxide out of water by aeration with air containing low carbon dioxide amounts, three areas were studied: the steady state (algal growth rates at various constant, maintained, dissolved carbon dioxide concentrations), the nonequilibrium case (natural atmospheric replenishment the sole carbon source), and algal growth with inorganic bicarbonate as sole carbon source. Carbon availability was studied by observations of growth rates of Chlorella, Mycrocystis, and Anabaena. Algae can efficiently utilize carbon dioxde at concentrations much lower than those present from atmospheric equilibria. It is very difficult to control growth by carbon dioxide control in systems open to the atmosphere. Bicarbonate is a good source of carbon and is at least 50% utilized at growth rates of at least 5 mg/l per day. May lakes can have massive algal blooms, using naturally present bicarbonate as sole carbon source. The atmosphere, without any vigorous or continuous wind mixing, is an adequate source of carbon dioxide for depths to at least 1.7 m, permitting algal growth rates up to 2 mg/l per day. (See also W72-09155) (Jones-Wisconsin)
W72-09168

DETERGENTS: NUTRIENT CONSIDERATIONS AND TOTAL ASSESSMENT,
Procter and Gamble Co., Cincinnati, Ohio. Environmental Water Quality Research Dept.
J. R. Duthie.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 205-216, 2 fig, 24 ref. American Society of Limnology and Oceanography Special Symposia Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Detergents, *Phosphates, *Eutrophication, Nutrients, Assessments, Algae, Formulation, Waste treatment, Industries, Water quality, Technology, Surfactants, Toxicity, Hazards, Biodegradation.
Identifiers: Nitrilotriacetate.

Proctor and Gamble intends to take phosphates out of laundry detergents as rapidly as possible and in a thoroughly reasonable manner. Search for and qualification of a phosphate replacement has been and continues to be the prime technical objective of their industry. The detergent industry does not expect those in the limnology field to share equally the burden of finding alternatives for phosphates, but there are certain things that scientists can do individually and as a group to create the climate in which responsible and productive changes can be made. When talking to laymen, detergent phosphates can be put into proper perspective making it clear that phosphate is an important detergent ingredient and, although an algal nutrient, it is not a pollutant or poison. Environmental assessments of NTA, now under way, should be completed. NTA still represents a very real hope as a phosphate replacement; it is the most tested replacement material. If, as expected, further testing clears the teratology questions raised from the preliminary testing of exaggerated levels of heavy metals and NTA, its use is sure to be considered. Realistic planning of waste treatment processes should be continued as nutrient removal is certain to be a necessity of the future. (See also W72-09155) (Jones-Wisconsin)
W72-09169

WASTEWATER TREATMENT AND EUTROPHICATION,
Wisconsin Univ., Madison. Water Resources Center.
G. A. Rohlich, and P. D. Uttormark.
In: Nutrients and Eutrophication: The limiting nutrient controversy, p 231-245, 1 fig, 4 tab, 37 ref. American Society of Limnology and Oceanography Special Symposia, Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Institutional constraints, *Waste water treatment, *Eutrophication, Nutrients, Costs, Phosphorus, Nitrogen, Municipal wastes, Industrial wastes, Cyanophyta, Water pollution sources, Septic tanks, Water quality control, Management, Economics, Social aspects, Legislation, Carbon.
Identifiers: Alum, Nutrient removal.

The various biological, chemical, and combined processes available for nutrient removal from wastewaters are described. Reference bibliography is included. Technical competence is available and costs are known. Wastewater treatment is one step in the complex cyclic pathways followed by nutrients and other waterborne materials. Wastewater treatment does not remove these materials; it simply allows for the disruption of one pathway and permits some control over pathways that are followed subsequently. The utilization of land disposal to increase crop production is one way the disruption of nutrient pathways might be beneficial. The concepts of systems analysis must be applied more broadly to wastewater treatment. For the rational utilization of wastewater processes as a comprehensive management tool, the biologists must attempt to describe, predict, and quantify response of aquatic ecosystems to changes in nutrient flux with a greater degree of accuracy than is presently possible and economists, lawyers, and social scientists must strive to identify more clearly the value of benefits derived from reduced nutrient inputs, and formulate the institutional and legislative arrangements necessary to implement efficiently the technology to prevent, retard, and alleviate undesirable effects of eutrophication. (See also W72-09155) (Jones-Wisconsin)
W72-09170

NUTRIENT MANAGEMENT IN THE POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
N. A. Jaworski, D. W. Lear, Jr., and O. Willa, Jr.
In: Nutrients and Eutrophication: The limiting-nutrient controversy, p 246-273, 11 fig, 17 tab, 35 ref. American Society of Limnology and Oceanography Special Symposia, Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Estuaries, *Eutrophication, *Water pollution control, Management, Analysis, Water quality, Cyanophyta, Nuisance algae, Comprehensive planning, Aquatic weeds, Water pollution sources, Mathematical models, Nitrogen, Abatement, Costs, Analytical techniques, Municipal water, Phosphorus.
Identifiers: *Potomac Estuary.

Water quality studies were undertaken to define wastewater treatment requirements of upper Potomac estuary since 1965. Studies and concepts used to formulate a nutrient management program are presented. Causes and control needs were studied relative to the changes in nutrient enrichment, including appearance of nuisance blue-green algae. Data from algal composition analysis, annual nutrient cycles and longitudinal profiles, bioassay studies, algal modeling, comparison with a noneutrophic estuary, and review of historical material were used to establish nutrient criteria. Based on a subjective analysis, desired upper limits of chlorophyll a concentrations were determined for establishing degree of eutrophication control required to minimize detrimental effects on water quality and water uses. Although at the present time no specific criteria relative to requirements for wastewater treatment have been established for the mesohaline portion of the estuary, specific nutrient criteria have been developed for the freshwater portion. With a properly designed facility the dissolved oxygen concentration may be enhanced and algal growth reduced. The water quality management program being developed will not only improve the water quality to meet minimum designated standards, but will render it a feasible source of municipal water supply. (See also W72-09155) (Jones-Wisconsin)
W72-09171

NUTRIENT FLUX IN ESTUARIES,
Georgia Univ., Athens. Dept. of Zoology and Georgia Univ., Athens. Computer Center; and Georgia Univ., Sapelo Island. Marine Inst.
L. R. Pomeroy, L. R. Shenton, R. D. H. Jones, and R. J. Reimold.
In: Nutrients and Eutrophication: The limiting-nutrient controversy, p 274-293, 12 fig, 5 tab, 47 ref. American Society of Limnology and Oceanography Special Symposia, Vol I, Allen Press, Lawrence, Kansas, 1972.

Descriptors: *Phosphorus, *Nutrients, *Metabolism, *Estuaries, *Cycling nutrients, Eutrophication, Turbidity, Georgia, Sediments, Streamflow, Seasonal, Cycles, Respiration, Mathematical models, Productivity, Intertidal areas, Tidal energy.
Identifiers: *Nutrient flux, Limiting nutrients, Shallow streams, Altamaha River Delta (Ga), Sapelo Sound (Ga), Duplin River (Ga), Doboy Sound (Ga).

In the three Georgia estuarine systems examined, phosphorus concentrations are larger by one or two orders of magnitude than the concentration of phosphorus in either the coastal seawater or the Altamaha River. The cycle of phosphorus concentration in estuarine water is controlled primarily by metabolic processes and secondarily by equilibria between sediments and water. Effect of flushing is negative and most pronounced in estuaries with major river influence. While direct exchanges between sediments and water seem secondary in importance, the biologically mediated movement of phosphate from deep sediments to water is possible only because the sediments contain a reservoir of available phosphate that is maintained by direct exchange. Perturbation of models of the flux of phosphorus in the estuaries suggests that the system would be equally stable if the phosphorus reserve in sediments were reduced by three orders of magnitude. Organic matter produces eutrophic succession in clear estuaries and anaerobic zones in turbid ones. Inorganic nutrients also produce eutrophic succession in clear estuaries but may have little effect on turbid ones. Phosphorus does not seem to be a limiting nutrient in any except some of the clearest, sediment-free estuaries. (See also W72-09155) (Jones-Wisconsin)
W72-09172

INVERTEBRATES COLLECTED ON AND AROUND CARROLL ISLAND, MARYLAND,
Edgewood Arsenal, Md.
Jerry C. Smrchek.
Available from the National Technical Information Service as AD-730 903, $3.00 in paper copy, $0.95 in microfiche. Technical Report EATR 4552, August 1971. 21 p, 40 ref.

Descriptors: *Invertebrates, *Maryland, *Biological communities, Systematics, Protozoa, Rotifers, Oligochaetes, Mollusks, Snails, Clams, Crustaceans, Shrimp, Fresh water, Brackish water, Marine animals, Copepods, Amphipoda, Isopods, Crabs, Terrestrial habitats, Insects, Diptera, Mosquitoes, Worms.
Identifiers: *Carroll Island (Md), Leeches, Pseudoscorpions, Spiders, Centipedes, Sow bugs, Beetles, Flies, Water fleas.

In order to measure the effects, if any, of chemical warfare agents on the Carroll Island, Maryland and Chesapeake Bay ecosystems, an inventory of species was taken. This area contains an abundant mixture of invertebrates. Studies included (some previously compiled) a limnological investigation of a large pond on a noncontaminated portion of the test area and regular sampling of soil-litter animals from areas around Agent Test Grid No 1, comparing abundance and diversity of invertebrate species in areas of heavy, light, and negligible agent contamination; and counts of benthic invertebrates from sediment samples taken from waters downwind of the test grids, from waters in the rainwater runoff area, and from control waters. In addition, regular collecting was conducted from various areas on Carroll Island. The list reflects those species within various groups that are abundant and can be used as a foundation for applied ecological research, including studies of food habits. Many of the organisms indigenous to the Carroll Island area could be used as valuable bioassay tools. Many others would be important indicators of environmental stress in programs involving the detection of decontamination products, toxic wastes, or agent leaks. (Jones-Wisconsin)
W72-09173

WATER POLLUTION IN DELHI LAKES,
Delhi Univ. (India). Dept. of Botany.
C. K. Varshney.
Schweizerische Zeitschrift Hydrologie 33 (1): 114-116. 1971.

Descriptors: *Lakes, Water pollution effects.
Identifiers: *Delhi lakes, *India.

Problems involved with pollution of lakes and rivers in Delhi, India, in connection with increasing human population are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-09175

PHOSPHORUS IN WASTEWATER EFFLUENTS AND ALGAL GROWTH,
Indian Inst. of Science, Bangalore. Dept. of Biochemistry.
E. G. Srinath, and S. C. Pillai.
Journal of Water Pollution Control Federation, Vol 44, No 2, p 303-308, 1972. 1 fig, 4 tab, 7 ref.

Descriptors: *Phosphorus, *Sewage effluents, *Algae, Waste water treatment, Activated sludge, Lime, Aerobic treatment, Domestic wastes.
Identifiers: Bangalore (India).

Samples from the wastewater treatment plant at the Indian Institute of Science and from three outfalls at Bangalore, India were examined over a period of 12 years and evidence collected on the concentration of phosphorus in domestic wastewater, phosphorus contents in effluents from different wastewater treatment processes, extent of algal growth in various wastewater effluents, influence of different concentrations of phosphorus on the growth of algae in water, and methods of removal of phosphorus from wastewater effluents. Phosphorus in wastewater and effluents was determined by the method recommended by Fiske and Subbarow and modified by King. The other items of analysis, except turbidity and algal growth, were carried out by standard methods. Among the aerobic biological methods of wastewater treatment, the activated sludge process removes the maximum amount of phosphorus; the remaining phosphorus is relatively small, but it must be removed if algal growth in the receiving water is to be controlled. It can preferably be eliminated by the addition of calculated amounts of a mixture of alum and lime. Experiments indicated that the concentration of phosphorus in water should be less than 0.05 mgP/l for control of algal growth. (Jones-Wisconsin)
W72-09176

ANIMAL-SEDIMENT RELATIONS AND COMMUNITY ANALYSIS OF A FLORIDA ESTUARY,
University of South Florida, Tampa. Dept. of Biology.
S. A. Bloom, J. L. Simon, and V. D. Hunter.
Marine Biology, Vol 13, No 1, p 43-56, 1972. 2 fig, 8 tab, 23 ref.

Descriptors: *Estuaries, *Benthic fauna, *Sediments, *Biological communities, Florida, Analysis, Particle size, Biomass, Salinity, Mathematical studies, Amphipoda, Insects, Larvae, Shrimp, Crabs, Molluscks.
Identifiers: *Trophic groups, Old Tampa Bay (Fla).

Quantitative information on shallow water estuarine infauna of Tampa Bay, Florida is assembled. Five assemblage species are identified, two constituting distinct communities, while a third appears to be an interdigitation of the two communities. Dominance by one species is the prevalent pattern within the assemblages. Numbers of deposit feeders are inversely correlated to that of filter feeders, and both trophic types are correlated to the sediment parameters of median grain size, sorting and skewness. Three transects with three stations each were established. A faunal sample, sediment sample, and a water sample were taken at each station in September, December, and March of 1968-1969. Sediment samples were wet-sieved. Animal samples were reduced to numbers of organisms and biomass per species. Trellis diagrams and correlation tests were generated. Support is shown for the trophic group-amensalism hypothesis. The silt-clay fraction is apparently of lesser importance to deposit feeders in Florida sediments than in Buzzards Bay. An attempt was made to relate an analysis of the optimal grain size for filter feeders to the trophic group-amensalism hypothesis. A view of communities as abstractions from continua is more realistic than communities as discrete units. (Jones-Wisconsin)
W72-09177

LIGHT-INDUCED INHIBITION OF RESPIRATION IN DCMU-POISONED CHLORELLA BY PHOTOSYSTEM I ACTIVITY,
University of Western Ontario, London. Dept. of Biophysics.
D. F. Sargent, and C. P. S. Taylor.
Canadian Journal of Botany, Vol 50, No 1, p 13-21, 1972. 9 fig, 1 tab, 25 ref.

Descriptors: *Respiration, *Chlorella, *Inhibition, Photosynthesis, Light intensity, Oxygen, Chlorophyll, Methodology, Color reactions, Wavelengths, Chemical reactions.
Identifiers: DCMU, Phenazine methosulfate, Adenosine triphosphate, Adenosine diphosphate, Chlorella pyrenoidosa, Carbon monoxide, Transients, Cyclic photophosphorylation.

A light-dependent energy trapping system which does not require the involvement of the total photosynthetic system has been postulated in recent years. It has now been demonstrated that the reduced net rate of oxygen uptake observed when DCMU-poisoned Chlorella are illuminated is a result of an inhibition of respiration rather than

residual photosynthetic oxygen evolution. Support for the idea that photosynthetic oxygen evolution was not involved in the DCMU-poisoned wild-type Chlorella culture used in these studies came initially from study of the transients in oxygen exchange. These can be broken down into two categories; light/dark or intensity transients and chromatic transients. The chromatic transients discovered by Blinks are well known and served as a major argument for the two systems model of photosynthesis. Such transients were easily detectable in the action spectrum apparatus with non-poisoned cells. The action spectrum of the inhibition effect demonstrates that chlorophyll a is the main photoreceptor, implicating system I of photosynthesis. Studies using PMS, which is known to stimulate cyclic photophosphorylation by photosystem I, show that respiratory inhibition is caused by change in the intracellular ATP/ADP balance as a result of cyclic photophosphorylation. (Jones-Wisconsin)
W72-09178

HOW SEATTLE BEAT POLLUTION,
Municipality of Metropolitan Seattle, Wash.; and Brown and Caldwell, Inc., San Francisco, Calif.
C. V. Gibbs, C. J. Henry, and F. J. Kersnar.
Water and Wastes Engineering, Vol 9, No 2, p 30-40, 1972. 7 fig.

Descriptors: *Water pollution control, *Comprehensive planning, *Local governments, Legislation, Sewage districts, Sewage treatment, Financing, Costs, Combined sewers, Pipeline foundations, Underwater, Pipelines, Pollution abatement.
Identifiers: *Seattle (Wash), Metropolitan government, Lake Washington (Wash), Puget Sound (Wash).

By 1955 both salty Puget Sound, Washington, and fresh water Lake Washington were seriously polluted. Suburban growth kept increasing and rectifying pollution was economically unfeasible for each community. A citizens committee was appointed in 1956 to prepare legislation to establish a metropolitan government. Since its formation, 'Metro' has outraced the construction schedule and has accomplished more than originally planned. Specific powers granted to the metropolitan corporation included preparation of a comprehensive plan, acquire, construct, operate, and regulate use of metropolitan sewerage facilities; require connection of local sewage systems to metropolitan facilities, fix rates and charges, and establish minimum standards for construction of local sewerage facilities and approve plans for their construction. The program was financed by the sale of revenue bonds to be repaid by monthly service charges for each user connection. A system was constructed consisting of 170 miles of interceptor sewers, 35 pumping stations, 11 regulator stations, and 7 treatment plants. Effluent discharges into Lake Washington fell to zero and by 1971 water quality had returned to the 1950 conditions. Criteria for peak flow rates and construction details are described. (Auen-Wisconsin)
W72-09179

ECOLOGICAL NICHES OF SYMPATRIC PHYTOPLANKTON SPECIES,
Pace Coll., New York; and Haskins Labs., New York; and New York Univ., N.Y. Courant Inst. of Mathematical Sciences.
M. Levandowsky.
The American Naturalist, Vol 106, No 947, p 71-78, 1972. 24 ref.

Descriptors: *Ecology, *Niches, *Phytoplankton, Distribution, Environmental effects, Balance of nature, Competition, Predation, Herbivores, Genetics, Life cycles, Diversification, Parasitism, Symbiosis.
Identifiers: *Niche definition, Sympatric organisms.

In defining an organism's niche, the defining qualities are not the Hutchinsonian abiotic and biotic variables themselves, but rather various aspects of such variables based on ways in which they influence the organism. Environmental variables are not independent in their effects on the organism's physiology. Five aspects of an environmental variable are considered. Species with convergent adaptations are linked by common requirements, referred to as the linking aspect. An aspect that can be 'used up' and hence can limit ultimate population size leads to competition and is termed the separating aspect. The effect of such biotic interactions as predation is termed a rarifying aspect; there are other purely biotic influence such as synergisms. When an organism is favored by or dependent upon the presence of another, it is termed a reinforcing aspect. Variability or regularity of recurrence of an environmental variable in any of its four aspects is the fifth aspect: it describes disposition and mode of occurrence of the other aspects and is called the variational aspect. The relevance of this scheme in describing niches of highly diverse phytoplankton populations and pauci-specific blooms of laboratory cultures is explored. (Jones-Wisconsin)
W72-09180

THE BENTHIC MACROFAUNA OF MORICHES BAY, NEW YORK,
Brookhaven National Lab., Upton, N.Y.
J. S. O'Connor.
The Biological Bulletin, Vol 142, No 1, p 84-102, 1972. 4 fig, 7 tab, 60 ref.

Descriptors: *Estuaries, *Benthic fauna, *Eutrophication, Biological communities, Sediments, Primary productivity, Clams, Mussels, Amphipoda, Crustaceans, Insects, Gastropods, New York.
Identifiers: Moriches Bay (NY), Macrobenthos, Decapoda, Pelecypoda, Tunicata, Polychaeta, Turbellaria, Nemertea, Echinodermata, Holothuroidea, Balanoglossida.

To learn more details of changes associated with eutrophication of estuaries and as a part of a longer series of studies of the Long Island estuaries, an extensive survey of subtidal benthic macrofauna of Moriches Bay was made. Quantitative sampling of subtidal macrobenthos of the shallow temperate lagoon shows several structural features of benthic communities in five biotopes. Past and present qualities of benthic structure are related to long-term nutrient and organic loading. While overall benthic species composition has apparently not changed drastically since 1938 some important changes in dominant species composition appear associated with the biology of principal species. The best estimate of average annual standing crop of the macrobenthos is lower than estimates in somewhat comparable estuaries, apparently because of low oxygen concentrations over extensive areas due to large summer influxes of nutrients and organic matter into this poorly flushed lagoon. Clear-cut associations between sediment type and mode of benthos feeding are demonstrated; suspension feeding invertebrates dominating in sandy sediments, and deposit feeders dominating in soft clayey silt bottoms. Species diversity appears fairly homogeneous over the bay with very low diversity in dredged channels. (Jones-Wisconsin)
W72-09181

STUDY ON THE TOXICITY OF AGRICULTURAL CONTROL CHEMICALS IN RELATION TO FRESHWATER FISHERIES MANAGEMENT: V. SOME EFFECTS OF SODIUM PENTACHLOROPHENATE TO FRESHWATER FISHES,
Yoshihiro Matida, Sekio Kimura, Motoyoshi Yokote, Hiroshi Kumada, and Hiraru Tanaka.
Bull Freshwater Fish Res Lab Tokyo. 20 (2): 127-146. 1971. Japanese summary.
Identifiers: Agricultural, Chemicals, Control, Fisheries, Fishes, Management, Phenate, Pollution, Relation, Runoff, Sodium, Soil, Toxicity.

Safety levels and tolerance limits of pesticides are given for some freshwater fish species in relation to pollution from agricultural soils runoff.—Copyright 1971, Biological Abstracts, Inc.
W72-09184

DISTRIBUTIONAL ECOLOGY AND BEHAVIORAL THERMOREGULATION OF FISHES IN RELATION TO HEATED EFFLUENT FROM A STEAM-ELECTRIC POWER PLANT (LAKE MONONA, WISCONSIN),
Wisconsin Univ., Madison. Water Resources Center.
W. H. Neill, and J. J. Magnuson.
Available from the National Technical Information Service as PB-209 895. Wisc9nsin Water Resources Center, Madison, Partial Technical Completion Report, 1972. 89 p, 16 fig, 1 tab, 41 ref. OWRR B-028-WIS (3).

Descriptors: *Electric powerplants, *Outlets, *Lakes, *Seasonal, *Fish, Temperature, Zooplankton, Growth rates, Wisconsin, *Thermal pollution, Littoral, *Ecological distribution, Distribution patterns.
Identifiers: *Lake Monona (Wis), *Feeding behavior, *Fish food, *Temperature preference, Lake Mendota, Dane County (Wis), Perca flavescens, Cottus bairdi, Morone mississippiensis, Ictalurus melas, Lepiscsteus osseus, Cyprinus carpic.

Cooling water for a 220-megawatt power plant is pumped from 5 m beneath Lake Monona's surface, heated about 10 C, and discharged into the littoral zone. Maximum temperatures in the effluent-outfall area approach 35 C in summer, and 14 C in winter; unheated parts of the littoral zone rarely exceed 29 C. To assess the distributional responses of fish to the operation of the power plant, the outfall area and two reference areas were electro-fished thirty times over a one-year period. Some fishes found in the reference areas avoided the outfall area, whereas other fishes were at higher concentration in the outfall area relative to the reference sites. The tendency for a species-size class to concentrate in or avoid the outfall area generally did not reverse from season to season or from day to night. Size-dependent movements of the fish tended to obscure the difference in growth rate of young fishes between study areas. Integrated laboratory studies on six species and field results suggest that fishes were distributed within the outfall area according to their different temperature preferenda. Also, thermoregulatory behavior was overridden by feeding behavior even though zooplankton food was more abundant in the outfall area.
W72-09236

EFFECTS OF SOUTH SHORE DRAINAGE BASINS AND CLAY EROSION ON THE PHYSICAL AND CHEMICAL LIMNOLOGY OF WESTERN LAKE SUPERIOR,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02H.
W72-09238

SPECIES AND INDIVIDUAL PRODUCTIVITY IN PHYTOPLANKTON COMMUNITIES,
Texas Univ., Austin. Dept. of Zoology.
B. Maguire, Jr., and W. E. Neill.
Ecology, Vol. 52, No. 5, p 903-907, Late Summer 1971. 1 fig, 2 tab.

Descriptors: *Algae, *Phytoplankton, *Primary productivity, Microscopy, Chlorophyta, Scenedesmus, *Cyanophyta, Chlorella, Biological communities, Dominant organisms, Aquatic productivity, Biomass, Carbon radioisotopes, Succession, Radioactivity techniques, Cultures.
Identifiers: Carbon-14, Carteria eugametos, Stichococcus, Chlorococcum, Hyalotheca, Lake Livingston, Autoradiography, Sample preparation, Scintillation counting.

The relative productivity of individual cells in a mixed phytoplankton community can be determined by C-14 autoradiography. In general, the technique involves placing C-14-labelled algal cells on microscope slides and covering them with a radiosensitive emulsion. After suitable exposure and photographic development, the cells and the silver grains produced by the radioactive decay of incorporated C-14 are clearly visible. The proportion of grains produced by each species is then used to partition community-wide measurements of primary production. Algal samples from artificial lake water in the laboratory and Lake Livingston were studied. Laboratory data showed Carteria, because of its size (685 cubic microns), to be more productive per cell than Chlorella (41 cubic microns) or Stichococcus (27 cubic microns) during both the 1-hr and 24 hr periods tested. However, in terms of productivity per unit volume per 24 hrs, Chlorella will become most dominant, Stichococcus subdominant, and Carteria progressively less important in number and ecological effect. Lake Livingston data showed Chlorella and blue-green algae predominating numerically but with Chlorella having the greatest biovolume. Although Chlorella produced far more photosynthate than all other species combined, its productivity per unit volume was considerably lower than that of Scenedesmus, Hyalotheca, and Chlorococcum. Chlorella could thus be replaced from the dominant position and unicellular blue-green algae eliminated as a significant part of the community. (Mackan-Battelle)
W72-09239

EFFECT OF A HOSTILE ENVIRONMENT ON PSEUDOMONAS AERUGINOSA,
Ciba Pharmaceutical Products, Inc., Summit, N.J. Research Dept.
F. W. Adair, S. G. Geftic, and J. Gelzer.
Transactions New York Academy of Sciences, Vol. 33, No. 8, p 799-813, December 1971. 10 fig, 17 ref.

Descriptors: *Surfactants, *Environmental effects, *Biological properties, Pseudomonas, Respiration, Ammonium compounds, Bactericides, Enzymes, Growth rates, Aerobic bacteria, Oxidation, Chemical degradation, Metabolism, Water pollution effects, Cultures, Electron microscopy, Water pollution effects.
Identifiers: *Pseudomonas aeruginosa, *Benzalkonium chloride, Sonication, Sodium lauryl sulfate, Ubiquinone, Cytochromes, Substrate utilization, Cytolysis, Ultrastructure, Mutation, Culture media.

The growth of benzalkonium chloride (BC)-resistant mutants and the BC-sensitive parent strain of Pseudomonas aeruginosa ATCCO 9027 in BC concentrations up to 2 mg/ml and 200 micrograms/ml, respectively, resulted in unusual physiological, metabolic, and ultrastructural changes. These changes included an increased generation time, greatly depressed rates of glucose and casamino acids oxidation, and the presence of single, centrally located inclusion bodies in the cytoplasm. Ubiquinone, cytochrome C sub 551, and cytochrome oxidase could not be isolated or detected by standard methods. Benzalkonium-chloride-resistant cells became stabilized to lysis by 10 percent NaOH, 10 percent HCl, and sonication. However, treatment of the resistant strain with the anionic surfactant sodium lauryl sulfate resulted in a rapid lysis that did not occur with the benzalkonium-chloride-sensitive parent strain. (Holoman-Battelle)
W72-09244

SOME QUANTITATIVE FEEDING PATTERNS EXHIBITED BY THE COPEPOD CALANUS,
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
Ye. G. Peruyeva.
Okeanologiya, Vol. 11, No. 2, p 232-239, 1971. 5 fig, 1 tab, 29 ref.

Descriptors: *Copepods, Crustaceans, Zooplankton, Algae, Feeding rates, *Larval growth stage, Phytoplankton, Nutrient requirements, Invertebrates, Chlamydomonas, Mathematical studies, Biological communities, Food chain, Diatoms, Larvae, Diets.
Identifiers: *Feeding patterns, *Calanus helgolandicus, Coscinodiscus, Copepodids, *Calanus glacialis, Ditylum, Prorocentrum, Nitzschia, Lauderia, Chaetoceros.

A study was made of the feeding of two widespread species-Calanus glacialis and C helgolandicus - on the large diatom Coscinodiscus sp. The differences noted in the shaping of the diet of the two species - asymptotic growth in stage V C. glacialis and linear growth in female C. helgolandicus in relation to the time of feeding - are caused by the different food requirements in the various stages of Calanus development. Satiation conditions (stage V C. glacialis) are characterized by the constant rate of movement of the crustaceans in the range of concentrations used and by increased selectivity with increasing food concentration. When C. helgolandicus females feed in places of insufficient concentrations, their speed of movement changes at different food concentrations and selectivity becomes independent of the concentration. (Mackan-Battelle)
W72-09248

GROWTH OF OBLIGATE AUTOTROPHIC BACTERIA ON GLUCOSE IN A CONTINUOUS FLOW-THROUGH APPARATUS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Bacteriology.
P. Pan, and W. W. Umbreit.
Journal of Bacteriology, Vol. 109, No. 3, p 1149-1155, March 1972. 7 fig, 1 tab, 24 ref.

Descriptors: *Photosynthetic bacteria, *Growth rates, *Organic compounds, Metabolism, Organic acids, Inhibitors, Cultures.
Identifiers: *Dialysis cultures, *Heterotrophic substrates, *Glucose, Nitrosomonas europaea, Nitrobacter agilis, Thiobacillus thioparus, Thiobacillus denitrificans, Thiobacillus neapolitanus, Thiobacillus thiooxidans, Substrate utilization, Media, Pyruvic acid, Chemolithotrophic bacteria, Keto acids, Thiosulfate, Differential media, Culture media.

Nitrosomonas europaea, Nitrobacter agilis, Thiobacillus denitrificans, T. neapolitanus, and T. thioparus (all obligate autotrophic bacteria) have been grown in dialysis culture, on glucose salts media, in the absence of their specific inorganic energy source. Metabolic products for N. agilis grown on nitrite salts medium were identified as keto acids. Pyruvic acid inhibited this organism at 0.00005 M. Keto acids were not inhibitory for the thiobacilli grown on thiosulfate medium. However, when T. denitrificans was grown on glucose with dialysis, addition of 0.00005 M pyruvate inhibited growth. Thus, it appears pyruvate may be inhibitory for other autotrophs, as has been reported for T. thiooxidans. (Holoman-Battelle)
W72-09318

COMPARISON OF METHODS OF ESTIMATING THE NUMBER OF ESCHERICHIA COLI IN EDIBLE MUSSELS AND THE RELATIONSHIP BETWEEN THE PRESENCE OF SALMONELLAE AND E. COLI,
Public Health Lab., Conway (Wales).
For primary bibliographic entry see Field 05A.
W72-09319

A COMPOSITE ARGININE GLUCOSE MEDIUM FOR THE CHARACTERIZATION OF PSEUDOMONAS AERUGINOSA AND OTHER GRAM NEGATIVE BACILLI,
Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Brewing and Biological Sciences.
D. J. Stewart.
Journal of Applied Bacteriology, Vol. 34, No. 4, p 779-786, December 1971. 4 tab, 15 ref.

Descriptors: *Cultures, *Pseudomonas, *Bacteria, Salmonella, E. coli, Enteric bacteria, Sewage bacteria, Soil bacteria, Pathogenic bacteria, Food processing industry, Aerobic bacteria, Anaerobic bacteria, Fluorescence, Biological properties, Separation techniques, Pollutant identification, Acid bacteria.
Identifiers: *Culture media, Pseudomonas aeruginosa, Pseudomonas putida, Pseudomonas fluorescens, Pseudomonas stutzeri, Pseudomonas maltophilia, Pseudomonas acidovorans, Pseudomonas testosteroni, Aeromonas liquefaciens, Agrobacterium radiobacter, Alcaligenes viscosus, Chromobacterium violaceum, Flavobacterium proteus, Flavobacterium suaveolens, Klebsiella aerogenes, Proteus vulgaris, Proteus morganii, Serratia marcescens, Salmonella typhimurium, Saprophytes, Differential media, Proteus.

A single tube, composite agar medium has been used to characterize Pseudomonas aeruginosa, Ps. putida, Ps. fluorescens and other gram negative bacilli based on the metabolic pathways they use to dissimilate glucose and arginine. Medium constituents were: 0.2 g Nutrient Broth No. 2 granules (Oxoid); 0.1 g L-arginine HCl; 1.0 g glucose; 6 ml indicator mixture of 0.03 g cresol red (BDH), and 0.02 g bromothymol blue (BDH) dissolved together by heating in 100 ml of 0.01 N NaOH; 0.8 g agar No. 3 (Oxoid); and distilled water to 100 ml. Nine milliliter amounts of the melted medium were added to test tubes which were closed with loose metal or plastic caps. After autoclaving at 121 C for 10 min, the medium was allowed to gel with a slope 4 cm long and a butt about 4 cm deep. Cultures were then stabbed and streaked and incubated at 30 C for 24-72 h. Different organisms were distinguished by their use of glucose, arginine, and other nutrients; production of gas; pH shifts, color changes and other characteristics according to seven reaction patterns. Paper chromatography was used to determine the products of argininic dissimilation. The medium provides for distinguishing certain pseudomonads from Aeromonas, Achromobacter, Enterobacteriacea and other Gram negative bacilli. (Mackan-Battelle)
W72-09320

FALLOUT CESIUM-137 IN CLAMS (RANGIA CUNEATA) FROM THE NEUSE RIVER ESTUARY, NORTH CAROLINA,
National Marine Fisheries Service, Beaufort, N.C. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05A.
W72-09337

MUTAGENIC EFFECT OF TCDD ON BACTERIA SYSTEMS,
Stockholm Univ. (Sweden). Institutionen for Biokemi.
S. Hussain, L. Ehrenberg, G. Lofroth, and T. Gejvall.
AMBIO, Vol. 1, No. 1, p 32-33, February 1972. 1 fig, 2 tab, 22 ref.

Descriptors: *Pesticides, *Genetics, *Pesticide toxicity, E. coli, *2 4 5-T, Toxicity, Herbicides, Polychlorinated biphenyls, Lethal limit, Bioindicators, Salmonella, Cultures, Nutrients, Water pollution sources, Water pollution effects.
Identifiers: *TCDD, Salmonella typhimurium, *Nutagens, Lethal dosage, DNA, Agars, Dimethyl sulfoxide, Prophages, Acridines, Streptomycin, Histidine, 2 3 7 8-tetrachlorodibenzo-p-dioxide.

TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) is a highly toxic impurity occurring in 2,4,5-T herbicide. Because it has a three-ring structure resembling that of acridines and other compounds that induce mutations, studies on its genetic effects were undertaken. Three tests were performed: (1) reversion to streptomycin independency in E. coli Sd-4, (2) reversion to histidine prototrophy in Salmonella typhimurium strains, and (3) prophage induction in E. coli K-39. Results indicate that TCDD is mutagenic. In E. coli SD-4, there was a high mutation frequency at concentrations of about 2 micrograms/ml. TCDD did not show any

mutagenic effect in S. typhimurium TA 1530, but high mutation frequencies were observed in the TA 1532 strain. This indicates that an acridine-like behavior causes the genetic effect of TCDD, i.e. mutations are induced through intercalation with DNA. The results could be significant in that some of the widely used PCB's contain impurities of chlorinated dibenzofurans, which have a three-ring structure resembling that of dibenzo-p-dioxin. (Mortland-Battelle)
W72-09338

CONTINUOUSLY SYNCHRONISED GROWTH,
National Research Council of Canada, Saskatoon (Saskatchewan). Prairie Regional Lab.
P. S. S. Dawson.
Journal of Applied Chemistry and Biotechnology, Vol 22, No 1, p 79-103, January 1972. 18 fig, 1 tab, 32 ref.

Descriptors: *Microorganisms, *Cultures, Growth chambers, Fungi, Bacteria, *Growth rates, Metabolism, Limiting factors, Kinetics.
Identifiers: *Synchronized cultures, *Continuous cultures, *Microbial growth, Chemostats, Synchronous cultures, Pulsed cultures, Phased cultures, Turbidostats, Candida utilis, Asynchronous cultures.

The advent of cell synchrony as a refinement in technique for cultivating microbes has given new dimensions to the study of microbial growth. By wedding synchrony to continuous culture, it becomes possible to convert and resolve the invariant (steady state) performance of asynchronous growth in a chemostat into a recognizable pattern of (cell cycle) activity, which repeats continually and occupies the mean doubling time periods of the cells growing in synchrony in a continuously synchronized culture. In this way, microbial growth and metabolism in a culture can be considered in terms of the individual cell instead of being related to the statistical mean of the cell population. Growth, continuous growth, and continuously synchronised growth are considered in relation to these developments and an approach is made to account for the 'physiological state'. (Holoman-Battelle)
W72-09340

INTRODUCTORY LECTURE: PROSPECTS AND PROBLEMS IN CONTINUOUS FLOW CULTURE OF MICRO-ORGANISMS,
Queen Elizabeth Coll., London (England). Dept. of Microbiology.
S. J. Pirt.
Journal of Applied Chemistry and Biotechnology, Vol 22, No 1, p 55-64, January 1972. 5 fig, 25 ref.

Descriptors: *Bacteria, Conferences, Equations, *Growth rates, *Metabolism, Quality control, Inhibitors, Fungi, E. coli, Mathematical studies.
Identifiers: *Chemostat theory, *Continuous flow cultures, Plug flow cultures, Klebsiella aerogenes, Penicillium, Aspergillus, Substrates.

This lecture given at a symposium marking the 21st anniversary of the publication of the theory of chemostat continuous-flow culture considers: (1) the basic concepts of continuous flow culture, (2) the need for extension of the theory of chemostat cultures, (3) conditions under which the theory breaks down, e.g. at slow growth rates, and (4) future problems and suggestions. The basic advantage of the chemostat over other culture methods are shown to be (1) it provides a means of controlling growth rate, (2) growth rate can be held constant while physical and nutritional conditions are changed, (3) it provides for 'substrate-limited growth' with constant concentration of the limiting substrate, (4) it allows for adjustment of biomass to a steady state in any given environment, and (5) it permits the most rapid conversion of substrate to biomass and growth-limited products. Extensions of the theory include: effects of inhibitors, two or more growth limiting substrates, and the effect of minimum growth rate in fungi and bacteria. (Mackan-Battelle)
W72-09341

THE BIODEGRADATION OF SOME SULFATED ALKANOLAMIDES,
Eastern Regional Research Lab., Philadelphia, Pa.
For primary bibliographic entry see Field 05B.
W72-09344

DISTRIBUTION OF CERTAIN HETEROTROPHIC AEROBIC BACTERIA IN EASTERN MEDITERRANEAN DEEP-SEA SEDIMENTS, (DISTRIBUTION DE CERTAINES BACTERIES HETEROTROPHES AEROBIED DANS LES SEDIMENTS PROFONDS DE MEDITERRANEE ORIENTALE),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
A. J. M. Bianchi.
Marine Biology, Vol 11, No 2, p 106-117, November 1971. 1 fig, 5 tab, 21 ref. English summary.

Descriptors: *Marine bacteria, *Sediments, Bacteria, Aerobic bacteria, Cultures, Photosynthetic bacteria, *Distribution patterns, Lipids.
Identifiers: *Heterotrophic bacteria, Eastern Mediterranean Sea, Media, Nitrate-reducing bacteria, Enumeration, Substrates, Substrate utilization, Amylose, Gelatin, Polysaccharides, Culture media.

Ninety five sediment samples were extracted from 16 cores collected at depths from 283 to 4,350 m in the Eastern Mediterranean Sea. Generally, the microbial population of superficial layers is lower than 100,000 bacteria/g sediment. At depths below 1,000 m this population is lower than 10,000. Bacterial counts at different levels of the sediment show that the microbial population is only important in the superficial layer. Below the surface, bacterial counts are generally between 100 to 1,000 cells/ml. Some levels appear to be sterile; none of the 12 culture media gave rise to development with the sediment samples. Studies of some physiological groups of bacteria show scarcity of chitinoclastic and agarolytic bacteria and absence of cellulolytic and sulphate reducers. On the other hand, amylolytic, gelatinolytic, lypolytic and nitrate-reducing bacteria are widely distributed among the microbial population of marine sediments. This population of deep sediments includes a few auxotrophic bacteria. (Holoman-Battelle)
W72-09349

THE SEASONAL SELECTION BY TEMPERATURE OF HETEROTROPHIC BACTERIA IN AN INTERTIDAL SEDIMENT,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
D. B. Nedwell, and G. D. Floodgate.
Marine Biology, Vol 11, No 4, p 306-310, December 1971. 4 fig, 10 ref.

Descriptors: *Sediments, *Incubation, *Soil temperature, *Diurnal distribution, *Intertidal areas, Estuarine environment, Sea water, Sampling, Cultures, Water temperature, Population.
Identifiers: *Heterotrophic bacteria, Menai Strait, Psychrophiles, Mesophiles, Thermophiles, Culture media, Agars.

The selective effects of seasonal temperatures upon bacteria in an intertidal sediment (Menai Strait, N. Wales) was studied and a simple demonstration of temperature adaptation of a mixed heterotrophic bacterial population presented. Surface sediment samples were taken at roughly monthly intervals with a sterile spatula at depths of not more than 5 mm. Plate counts of the heterotrophic bacteria were made by suspending a known weight of sediment in sterile aged sea water and then shaking, diluting, and spreading it on agar plates and incubating at 5, 10, 20 and 30 C. Sediment temperatures were measured within the sediment at depths of 1, 5, 10, and 20 cm, and the effect of diverse temperatures upon the heterotrophic bacteria in the soil determined. A temperature adaptation index was calculated for the heterotrophic bacterial population and changes in the value of this index were shown to be correlated with seasonal changes of environmental temperature. (Snyder-Battelle)
W72-09350

BACTERIAL POPULATIONS AS COMPONENTS OF OCEANIC ECOSYSTEMS,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05B.
W72-09351

CONTRIBUTION OF THE STUDY OF ZOOPLANKTON IN LEBANESE WATERS, (CONTRIBUTION A L' ETUDE DU ZOOPLANCTON DES EAUX LIBANAISES),
Lebanese Univ., Beirut. Faculty of Sciences.
For primary bibliographic entry see Field 05A.
W72-09355

INFLUENCE OF 2,4-DINITROPHENOL ON RESPIRATION AND CONCENTRATION OF SOME METABOLITES IN EMBRYOS OF THE HERRING CLUPEA HARENGUS, (EINFLUSS VON 2,4 DINITROPHENOL AUF DIE ATMUNG UND DIE KONZENTRATION EINIGER METABOLITE BEI EMBRYONEN DES HERINGS CLUPEA HARENGUS),
Biologische Anstalt Helgoland (West Germany).
R. Stelzer, H. Rosenthal, and D. Siebers.
Marine Biology, Vol 11, No 4, p 369-378, December 1971. 7 fig, 57 ref.

Descriptors: *Herrings, *Embryonic growth stage, *Respiration, *Fish eggs, Absorption, Sugars, Amino acids, Phenols, Aromatic compounds, Toxicity, Carbohydrates, Metabolism, Pesticide toxicity, Bioassay.
Identifiers: *2 4-dinitrophenol, Metabolites, Warburg technique, *2 4-DNP, *Clupea hargenus, Polysaccharides, Accumulation, Adenosine triphosphate.

In rearing experiments with herring eggs oxygen consumption under normal conditions and after addition of 2,4-DNP (concentration equals 0.1 millimoles/1; pH equals 8.1) was measured over the period of embryonic development by means of the Warburg-technique. Additionally, the concentration of low molecular sugars, polysaccharides, free amino acids, and adenosine triphosphate (ATP) was determined. Under the influence of 2,4-DNP, the embryos increase their respiration intensity after a short period of incubation. The maximum rise in percentage over the normal values reaches up to 400 percent at the beginning of gastrulation, falls to 50 percent even before the locking of the blastopore, and decreases slightly to about 30 percent until hatching. The immense decline in the percentage increase in respiration following the addition of 2,4-DNP at the end of the first day of development is caused by the rapid increase in normal respiration. After poisoning with DNP at different stages of development, the uncoupled respiration curves are normally almost equal. The content in low molecular sugars and polysaccharides decreases slightly in the course of embryonic development and, following the addition of 2,4-DNP, decreases considerably during the first 24 hours. After 48 hours, accelerated decomposition of carbohydrates continues. Under the influence of 2,4-DNP, the embryos metabolize more carbohydrates in 1 day than during the whole normal development period. The concentration of free amino acids, almost equal during normal embryonic development, remains unchanged under the influence of 2,4-DNP. (Holoman-Battelle)
W72-09356

CHALCOCITE OXIDATION AND COUPLED CARBON DIOXIDE FIXATION BY THIOBACILLUS FERROOXIDANS,
Brigham Young Univ., Provo, Utah. Dept. of Microbiology.

A. M. Nielsen, and J. V. Beck.
Science, Vol. 175, No. 4026, p 1124-1126, March 10, 1972. 1 fig, 1 tab, 8 ref.

Descriptors: *Copper compounds, *Photosynthesis, Oxygen, Copper, Carbon dioxide, Sulfides, Arizona, Manometers, Iron, Methodology, Reduction (Chemical), Heavy metals, Solvation, Energy conversion, Cultures.
Identifiers: *Thiobacillus ferrooxidans, *Chalcocite, Ferrobacillus.

A culture of Thiobacillus ferrooxidans, a chemolithoautotrophic bacterium, was obtained from a copper mine in Arizona for use in determining whether this bacterium catalyzes the oxidation of Cu (+) in chalcocite to Cu (2+) and simultaneously fixes carbon dioxide. Cell suspensions were prepared by resuspending centrifuge-sedimented cells in 0.01N sulfuric acid to a cell density equivalent to about 1.0 microgram of cellular nitrogen per milliliter. The cell suspension was added to a flask containing a ground sample of chalcocite (Cu2S), KH2PO4, H2SO4, and carbon-14-labelled NaHCO3. Oxygen uptake was measured during the experiment using manometric methods with Warburg-type reaction vessels. The reaction of cell suspensions resulted in oxygen uptake accompanied by increased solubilization of copper and fixation of carbon dioxide. The ratio of oxygen consumed to microbially solubilized copper was 0.43. The only detectable oxidized products were cupric ions and an oxidized form of sulfide mineral. Therefore, the apparent source of energy for the carbon dioxide fixation was the cuprous copper of the chalcocite. (Snyder-Battelle)
W72-09359

EFFECTS OF ORGANOCHLORINE INSECTICIDES ON BACTERIAL GROWTH, RESPIRATION AND VIABILITY,
University Coll. of Wales, Aberystwyth. Dept. of Biochemistry; and University Coll. of Wales, Aberystwyth. Dept. of Agricultural Biochemistry.
P. W. Trudgill, R. Widdus, and J. S. Rees.
Journal of General Microbiology, Vol. 69, No. 1, p 1-13, November 1971. 6 fig, 4 tab, 45 ref.

Descriptors: *Bacteria, *Pesticide toxicity, *Insecticides, Respiration, Growth, Endrin enzymes, Heptachlor, DDT, Dieldrin, Aldrin, Pathogenic bacteria, Amino acids, E. coli, Microbiology, Carbon radioisotopes, Gas chromatography, Cultures, Enteric bacteria.
Identifiers: Gram-positive bacteria, Gram-negative bacteria, Chlordane, Hexachlorocyclohexane, Thiodan, Bandane, Telodrin, Gram stain, Gram-variable bacteria, *Viability, Leucine, Staphylococcus, Bacillus megaterium, Bacillus subtilis, Streptomyces antibioticus, Nocardia, Corynebacterium, Bacillus cereus, Nocardia, Microbacterium flavum, Micrococcus lysodeikticus, Staphylococcus albus, Staphylococcus aureus, Sacrina lutea, Streptococcus faecalis, Arthrobacter simplex, Pseudomonas iodinum, Achromobacter butyri, Achromobacter, Klebsiella aerogenes, Pseudomonas acidivorans, Pseudomonas aureofaciens, Pseudomonas dehalogens, Pseudomonas fluorescens, Pseudomonas multivorans, Pseudomonas putida.

Technical grade organochlorine insecticides, chlordane, endrin, gamma-hexachlorocyclohexane, telodrin, alpha-chlordane, gamma-chlordane, bandane, heptachlor, aldrin, dieldrin, thiodan, and DDT, were applied to nutrient agar plates as surface films (0.5 mg/sq cm) by placing the solvated chemical on the agar and allowing the solvent to evaporate. The plates were inoculated from stock agar slopes and growth assessed visually after 24 and 48 hours. During stock growth L- (U-C-14)leucine was added to the cultures and presumed used by the organism, providing an intracellular tag for further testing. The gram-negative organisms (Achromobacter sp., A. butyri, Klebsiella aerogenes, Pseudomonas acidivorans, P. aureofaciens, P. dehalogens, P. fluorescens, P. multivorans, P. putida) tested were, almost without exception, resistant to the organochlorine insecticides, while gram-positive organisms (Bacillus megaterium, B. subtilis, Streptomyces antibioticus, Nocardia sp., Corynebacterium sp., B. cereus, Microbacterium flavum, Micrococcus lysodeikticus, Staphylococcus albus, S. aureus, Sarcina lutea, Streptococcus faecalis) showed a variation of susceptibility. Bacillus species are most sensitive, while Staphlococci and Sarcina much less so. DDT and gamma hexachlorocyclohexane inhibited only a few Gram (+) organisms tested. Organisms inhibited showed a decline in viable count and respiration with a delayed release of incorporated L- (U-C-14)leucine and L-malate dehydrogenase and a decline of enzyme E580. These results indicate that the inhibition mechanism may involve a disruption of a membrane-associated metabolic system, including electron transport and cell wall biosynthesis, leading to cell lysis. (Mackan-Battelle)
W72-09361

A PRELIMINARY INVESTIGATION OF BOTTOM FAUNA AND INVERTEBRATE DRIFT IN AN UNREGULATED AND A REGULATED STREAM IN ALBERTA,
Calgary Univ. (Alberta). Dept. of Biology.
D. S. Radford, and R. Hartland-Rowe.
Journal of Applied Ecology, Vol. 8, No. 3, p 883-903, December 1971. 10 fig, 4 tab, 32 ref.

Descriptors: *Benthic fauna, *Streams, *Aquatic drift, *Regulated flow, *Canada, Sampling, Caddisflies, Light intensity, Water temperature, Discharge, Reservoirs, Runoff, Seasonal, Biomass, Mayflies, Stoneflies, Flow rates, Invertebrates, Aquatic insects, Rivers, Standing crops, Flowmeters.
Identifiers: *Drift organisms, *Species diversity, *Kananaskis River, *Lusk Creek, *Alberta (Canada), Surber sampler, Plankton sampler, Sample preservation, Discharge pattern, Invertebrate drift, Paraleptophlebia rufivenosa, Siphlonurus occidentalis, Ephemeroptera, Trichoptera, Parapsyche elsis, Glossosoma pterna, Rhithrogena doddsi, Ephemerella doddsi, Epeorus longimanus, Cinygmula spp, Baetis spp, Alloperla spp, Ephemerella coloradensis, Paraleuctra, Isoperla spp, Brachyptera nigripennis, Nemoura cinctipes, Nemoura besametsa, Nemoura columbiana, Epeorus spp, Nemoura oregonensis, Epeorus grandis, Arcynopteryx aurea, Nemoura cinctipes.

Two mountain streams in Alberta, one subject to flow regulation, were investigated to assess the effect of fluctuating stream flows on standing crops and drift of benthic organisms. Water discharge rates, stream temperatures, and the nature and composition of the benthos were studied. Species in the regulated stream were characterized by torrential forms, and low standing crops were attributed to extremes in discharge. A high percentage of the bottom fauna was composed of ephemeropteran species and two genera of Plecoptera. Nemouna spp. and two species of Trichoptera were adversely affected by the fluctuating stream flows. More individuals were taken at dark with the greatest number obtained during the period 3 hours after sunset and the least in the late afternoon. Reductions in stream flow caused increases in invertebrate drift and reservoir releases had the same effect. (Mortland-Battelle)
W72-09362

RELEASE OF DISSOLVED ORGANIC MATTER FROM NATURAL POPULATIONS OF MARINE PHYTOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
J. P. Thomas.
Marine Biology, Vol. 11, No. 4, p 311-323, December 1971. 7 fig, 6 tab, 44 ref.

Descriptors: *Phytoplankton, *Estuaries, Coasts, Oceans, Marine biology, On-site investigations, Chemical analysis, Organic matter, Carbon cycle, Metabolism, Dissolved solids, Organic compounds, *Georgia, Southeast U.S.A., Tagging, Carbon radioisotopes, Aquatic populations, Extraction, Separation techniques, *Photoactivation, Data collections, Measurement, Trophic level, Radioactivity techniques, Primary productivity.
Identifiers: *Dissolved organic matter, Sargasso Sea, C-14, Photochemistry, Photo-oxidation, Particulate organic matter, Hyamine, Sample preparation, Organic carbon.

Three areas ranging from oligotrophic to eutrophic were chosen to test a new method for measuring the rate of release of dissolved organic matter (DOM) produced by natural populations of estuarine, coastal, and oceanic phytoplankton. The method employs an improved gas-washing apparatus for removing inorganic from organic C-14. Problems of long incubation times, high initial activity of the inorganic tracer (C-14) added to the sample, and self absorption were overcome and sensitivity increased by using a larger portion of sample filtrate. Results show that phytoplankton in Georgia estuaries release less than 1 to 40 mg C/cu m/day, in southeastern USA coastal waters from 0 to 19 mg C/cu m/day, and in the westernmost Sargasso Sea from 0 to 2 mg C/cu m/day. The percent of photoassimilated carbon released as DOM increases seaward. The percents are less than 7 percent in the Georgia estuaries, generally less than 13 percent in southeastern USA surface coastal waters, generally less than 21 percent for these coastal waters below the surface, and less than 44 percent for the westernmost Sargasso Sea. Primary productivity measurements for estuaries and coastal waters appear to correlate well with previous studies; however, the values for oceanic waters indicate previous values were underestimated by 50 percent. (Mackan-Battelle)
W72-09363

RESPONSE OF ESCHERICHIA COLI B/R TO HIGH CONCENTRATIONS OF SUCROSE IN A NUTRIENT MEDIUM,
Pennsylvania State Univ., University Park. Dept. of Biophysics.
P. O. Scheie, and R. Rehberg.
Journal of Bacteriology, Vol. 109, No. 1, p 229-235, January 1972. 7 fig, 28 ref.

Descriptors: *E. coli, *Cultures, *Synthesis, Bioindicators, *Nutrients, *Growth rates, Microscopy, Spectrophotometry, Incubation, Radioactivity techniques, Absorption, Enteric bacteria.
Identifiers: *Sucrose, Nutrient broth, Plasmolysis, Agars, DNA, DNA synthesis, RNA, Escherichia intermedia, Thymine, Uracil, Proline, Culture media, Differential media, C-14.

A study was made to evaluate the response of E. coli cells to high concentrations of sucrose under conditions that otherwise would permit optimal synthesis and growth. E. coli B/r cells were grown in air-bubbled Nutrient Broth (Difco) containing appropriate amounts of dissolved, reagent-grade sucrose (concentrations up to 1 m). Cellular response was measured by microscopic examination at magnifications of 1,000 to 2,000, by OD measurement with a spectrophotometer, by analysis of colony-forming ability, and by radioactivity techniques. Plasmolysis seldom was evident 2 minutes after cells were placed in the Nutrient Broth-sucrose medium, even at sucrose concentrations of 1M. Subsequently, there were transient decreases in optical density and appearance changes as seen under phase optics. No transient effects were detected in the synthetic rates or in the division of survivors. The possible significance of these findings is discussed. (Mortland-Battelle)
W72-09364

GAS CHROMATOGRAPHIC ANALYSIS OF THE HIGHER FATTY ACIDS OF THE ALGA CHLORELLA VULGARIS (PYRENOIDOSA),
Institute for Research, Production and Uses of Radioisotopes, Prague (Czechoslovakia).
For primary bibliographic entry see Field 05A.

W72-09365

FACTORS INVOLVED IN THE ISOLATION OF CLOSTRIDIUM PERFRINGENS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Anaerobe Lab.
For primary bibliographic entry see Field 05A.
W72-09370

EFFECTS OF INCUBATION TEMPERATURE ON THE SALT TOLERANCE OF SALMONELLA,
Washington Univ., Seattle. Inst. for Food Science and Technology.
J. R. Matches, and J. Liston.
Journal of Milk and Food Technology, Vol. 35, No. 1, p 39-44, 1972. 5 fig, 18 ref.

Descriptors: *Salmonella, *Salt tolerance, *Temperature, *Food processing industry, Cultures, Incubation, Growth rates, Pathogenic bacteria, Salinity.
Identifiers: Salmonella heidelberg, Salmonella derby, Salmonella typhimurium, Nutrient broth, Culture media, Differential media.

Salmonella heidelberg, S. typhimurium, and S. derby were grown in nutrient broth containing 0 to 8 percent added NaCl and tested by shake cultures at 8, 12, 22, and 37 C, to determine the growth potential for Salmonella in the presence of salt at various temperatures. Salmonella was inoculated into 20 ml of nutrient broth containing desired levels of sodium chloride in 50-ml Erlenmeyer flasks fitted with side arms. Samples were incubated at desired temperatures and cells counted by either the drop plate method (samples incubated at 8 C) or by turbidity measurements at 660 nm with a spectrophotometer (samples incubated at 12, 22, and 37 C). At 8 C, growth of S. heidelberg took place in 1 and 2 percent added NaCl; S. typhimurium increased in numbers in 1 percent added NaCl; and S. derby failed to increase. At 12 C, the three serotypes were all able to increase in numbers in the range of 0 to 4 percent NaCl. At 22 C, this range increased from 0 to a maximum of 5 to 8 percent. When incubated at 37 C, the organisms were able to increase in numbers in up to 7 to 8 percent NaCl. The salinity of the medium was not found to increase the maximum growth temperature of S. heidelberg. Low levels of salt stimulated growth of salmonellae, especially at temperatures lower than the optimum for the organism. (Synder-Battelle)
W72-09371

CONTROLLED EUTROPHICATION-INCREASING FOOD PRODUCTION FROM THE SEA BY RECYCLING HUMAN WASTES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05G.
W72-09378

POLLUTANTS AND FOOD-CHAINS,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
F. Moriarty.
New Scientist, Vol 53, No 787, p 594-596, March 16, 1972. 1 fig.

Descriptors: *Pollutants, *Food chains, *Metabolism, *Toxicity, Insecticides, Carnivores, Herbivores, Path of pollutants, Absorption, Chlorinated hydrocarbon pesticides, Pesticides, Mathematical models, Fish, Birds, Pesticide toxicity.
Identifiers: Excretion, Adipose tissue, Biological magnification, Fate of pollutants, Tissue.

The persistence of insecticides in the environment is relatively well known, but persistence within living organisms is not. Living organisms are known to contain far higher concentrations of certain insecticides such as the organochlorine pesticides than occur in the environment. Mathematical models used in studying the quantitative relationships between rate of intake and loss of drugs can also be used to study the kinetics of pollutants, e.g., the organochlorine insecticides. An example is the compartmental model. The insecticide concentration in tissue depends on intake rate; if the rate is constant, a plateau level is reached. However, with constant rates of insecticide intake over a period of time, the tissue concentration may change again. The existence of plateau levels implies that excretion and/or metabolism rates are equal to the absorption rates. Due to the uncertainty of pesticide kinetics in living organisms, factors such as the (1) degree of exposure, (2) mode of entry, (3) organism's habitat, (4) organism's position in the food chain and the (5) rate at which the insecticide can be eliminated must be considered in studies of bioaccumulation of pesticides and their effects on organisms. (Snyder-Battelle)
W72-09402

DIURNAL UPTAKE OF NO3 AND NH4 BY A CERATOPHYLLUM-PERIPHYTON COMMUNITY,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
D. W. Toetz.
Limnology and Oceanography, Vol 16, No 5, p 819-822, September 1971. 2 tab, 6 ref.

Descriptors: *Mass spectrometry, *Nitrogen, *Nitrates, *Ammonia, Water quality, Biological communities, *Periphyton, Plant growth, On-site investigations, Biomass, Weight, Nutrients, Radioactivity techniques, Bioassay, Tracers, Absorption.
Identifiers: *Ceratophyllum demersum, Assimilation, Nitrogen-15, Macrophytes, Sample preparation.

Samples of Ceratophyllum (344-1,131 mg/bottle) were obtained from an artificial lake in Oklahoma, placed in four 2-liter bottles for incubation. N-15 tagged ammonium and N-15 tagged potassium nitrate were added to 2 bottles; all four were incubated horizontally in the pond at 30 cm, and irradiance and temperature monitored at that depth. At the end of incubation, each bottle was poisoned with formalin, and the plants washed and held at minus 20C for a month. Before chemical analysis, the plants were dried, weighed, crushed, and about 10 mg digested for 18 hr with reagents recommended by Bremner. Ammonium was distilled into dilute Hcl, converted to N2 with alkaline hypobromite and the N2 pumped into tubes and sealed until isotope ratios were determined with a mass spectrometer. During the original plant collection, six random samples were collected and used in the estimation of biomass: fresh wt., dry wt., ash wt., and Kjeldahl nitrogen. Riley and Mullin's method was used for ammonium-N and nitrate-N analysis of these samples. Results show that the community assimilated ammonium both during the day and night. The rate of nitrate assimilation was strongly dependent on light, uptake being substantially low at night. The data indicate that the respective rates of nitrate and ammonium assimilation during 1440-1840 hours can be expanded to estimate a daily rate in agreement with that observed empirically. (Mackan-Battelle)
W72-09406

MECHANISM OF THE GROWTH INHIBITORY EFFECT OF CYSTEINE ON ESCHERICHIA COLI,
Debrecen Univ. of Medicine (Hungary). Dept. of Pharmacology.
C. Kari, Z. Nagy, P. Kovacs, and F. Hernadi.
Journal of General Microbiology, Vol 68, Part 3, p 349-356, November 1971. 5 fig, 1 tab, 25 ref.

Descriptors: *Cultures, *Metabolism, *Growth rates, Amino acids, Spectrophotometry, Enzymes, Analytical techniques, Data analysis, Vitamin B, Radioactivity techniques, *E. coli, Inhibitors.
Identifiers: *Cysteine, Cysteamine, Culture media, RNA, Uracil, Differential media.

E. coli cultivated on mineral salts medium, supplemented with 0.5 percent (w/v) glucose, was used to determine the mechanism for growth inhibition of cysteine. Exponentially growing cultures were used in all experiments with amino acids and vitamin B (as thiamine HCL) being added when required. Radioactive carbon labelled-uracil was used for measurement of net RNA synthesis. Overnight cultures were incubated aerobically at 37C in a waterbath shaker after being diluted 30-fold in prewarmed fresh medium. Extinction of cultures was measured with a spectrophotometer at 50 nm using 0.5 cm cuvettes. Results indicated cysteine above 0.2 millimoles inhibits growth on minimal medium by a mechanism which may involve interference with leucine, isoleucine, threonine and valine biosynthesis; above 2 millimoles cysteine and cysteamine in culture media with the above amino acids had an effect which may involve interaction with membrane bound respiratory enzymes. (Snyder-Battelle)
W72-09407

OCEANS AS ALPHABET SOUP: FOCUS ON DDT AND PCB'S,
For primary bibliographic entry see Field 05B.
W72-09409

THE TEMPORARY ABATEMENT OF NUISANCE SPECIES OF TRICHOPTERA WITH DDD (TDE) LARVICIDE,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
F. J. H. Fredeen.
Canadian Entomologist, Vol 104, No 2, p 145-163, February 1972. 2 fig, 9 tab, 22 ref.

Descriptors: *Caddisflies, *DDD, *Pesticide toxicity, *Aquatic insects, *Larvicides, *Chlorinated hydrocarbon pesticides, Fish, Mollusks, Aquatic animals, Birds, Pesticides, St. Lawrence River, Amphipoda, Isopods, Gastropods, Pesticide residues, Insectides, Invertebrates, Diptera, Oligochaetes, Canada, Growth stages, Larval growth stage, Cladophora, Water pollution effects, Water quality, Water temperature, Hydrogen ion cencentration, Dissolved oxygen, Carbon dioxide, Sampling.
Identifiers: Metabolites, Macroinvertebrates, Cheumatopsyche speciosa, Brachycentrus lateralis, Athripsodes cancellatus, Hydropsyche morosa, Decapods, Athripsodes tarsi-pumctatus, Athripsodes annulicornis, Repopulation, Data interpretation, Hydropsyche spp, Hydropsyche recurvata, Hydropsyche scalaris, Cheumatopsyche spp, Cheumatopsyche campyla, Macronemum zebratum, Polycentropus spp, Psychomyia flavida, Brachycentrus spp, Hydroptila spatulata.

Nuisance species of riverine insects were temporarily eliminated from the Expo 67 site at Montreal in 1967 by four applications of an emulsifiable formulation of DDD (TDE) to the St. Lawrence River, one in each of the months of May, June, July, and August. In each treatment sufficient DDD was applied 1.5 miles above the infested rapids to provide a concentration of about 0.4 ppm of DDD in the water, throughout a period of about 15 minutes. Each treatment caused the immediate detachment of about 98 percent of the Trichoptera larvae (mainly Hydropsychidae), and lesser percentages of other aquatic arthropods. No observable effects on fish were detected. Populations of arthropods, especially amphipods, rapidly restored themselves after each treatment. During August, both amphipods and gastropods were more abundant in treated than in untreated rapids. Residues of DDD were negligible and were expected to be relatively non-persistent. Occasional swarms of Trichoptera of relatively minor proportions, detected at the Expo 67 site by light traps, presumably arrived on steady southerly winds from the untreated Lachine Rapids more than 7 miles upriver. Information about the decomposition of DDD and related chlorinated hydrocarbons in nature is reviewed. (Holoman-Battelle)
W72-09412

POSSIBLE ORIGIN OF CLOSTRIDIUM BOTULINUM CONTAMINATION OF ESKIMO FOODS IN NORTHWESTERN ALASKA,
Arctic Health Research Center, Fairbanks, Alaska.
L. G. Miller, P. S. Clark, and G. A. Kunkle.
Applied Microbiology, Vol 23, No 2, p 427-428, February 1972. 1 tab, 11 ref.

Descriptors: *Clostridium, *Botulism, *Alaska, *Soil microbiology, Soil bacteria, Sampling, Cultures, Intertidal areas, Soil analysis, Analytical techniques, Pathogenic bacteria, Isolation, Incubation, Path of pollutants, Foods, Soil contamination.
Identifiers: Clostridium botulinum, Culture media, Sample preservation.

Soil samples were collected from beaches in northwestern Alaska and examined for the presence of Clostridium botulinum. Samples were collected aseptically in screw-cap vials and refrigerated until cultured 12-14 months later. Five grams of soil were transferred into 120 ml of freshly prepared TPGY (Trypticase, 5 percent; peptone, 0.5 percent; glucose 0.4 percent; yeast extract, 2 percent; sodium thioglycolate, 0.1 percent) and incubated in loosely stoppered water dilution bottles under anaerobic conditions at 28 C. Cultures were examined for toxins at 4 and 7 days. Toxins were detected by intraperitoneal injection into mice and typed by identification of isolates. Each locality sampled indicated the presence of C. botulinum. (Snyder-Battelle)
W72-09417

MERCURY IN THE ENVIRONMENT - AN ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W72-09420

RECREATIONAL USE OF THE COLUMBIA RIVER: EVALUATION OF ENVIRONMENTAL EXPOSURE,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 06B.
W72-09426

PUBLIC SAFETY AND UNDERGROUND NUCLEAR DETONATIONS,
For primary bibliographic entry see Field 05G.
W72-09427

GYPSY MOTH SUPPRESSION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-09466

UPTAKE, ASSIMILATION, AND LOSS OF DDT RESIDUES BY EUPHAUSIA PACIFICA, A EUPHAUSID SHRIMP,
Southeastern Massachusetts Univ., North Dartmouth. Dept. of Biology.
J. L. Cox.
Fishery Bulletin, Vol. 69, No. 3, p 627-633, 1971. 5 fig, 3 tab, 16 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Pesticide kinetics, Pesticides, Organic pesticides, Insecticides, Halogenated pesticides, Pesticide residues, Absorption, Water pollution effects, *Shrimp.
Identifiers: *Euphausid shrimp, Euphausia spp.

Euphausia pacifica, an abundant euphasid shrimp from the California Current, can acquire sufficient DDT residue from its food to account for amounts found in its tissues. Assimilation efficiencies for DDT in ingested food are similar to published figures for assimilation of carbon from food. The concentration vs. size function suggested by gas-liquid chromatographic analysis of DDT residues in this species, however, was quite different from the function predicted by a theoretical food assimilation model. Direct uptake of C-14-DDT from water was rapid and partially reversible by returning animals to unlabelled flowing sea-water. Uptake equilibrium was reached within 72 hr for smaller animals of less than 3 mg dry weight; larger animals apparently equilibrated for a longer period. C-14-DDT present in animals after 2 weeks exposure to unlabelled flowing water was retained in higher amounts in larger animals of greater than 3 mg dry weight. The possible effects of dietary changes, moulting, and surface to volume ratios on observed natural levels are discussed. (Svensson-Washington)
W72-09519

A NEW SPECIES OF TROGLOBITIC ASELLID FROM ILLINOIS,
Illinois Univ., Urbana. Dept. of Zoology.
H. R. Steeves, III, and A. J. Seidenberg.
The American Midland Naturalist, Vol. 85, No. 1, p 231-234, January 1971. 6 fig, 8 ref.

Descriptors: *Isopods, *Aquatic populations, *Fecundity, Water pollution effects, Illinois, Larvae, Larval growth stages.
Identifiers: *Troglobitic asellids, *Population structure, Asellus spp.

A new species of troglobitic asellid from Illinois (Asellus kendeighi) is described. Observations concerning the population structure of this isopod are presented. Females clearly dominate the size classes up through 9 mm. The largest male collected was 14.9 mm; the largest female was 10.9 mm. The only ovigerous females observed were collected in June 1967 and July 1968 and ranged from 6.2 to 8.8 mm long. The maximum number of eggs observed was 21 in a 7.4 mm long female. The occurrence of ovigerous females in June and July, and the absence of individuals less than 5 mm in length from February to April are consistent with a cyclic summer reproductive schedule. Isopods newly released from the brood pouch are 1.5 mm long. (Svensson-Washington)
W72-09520

HIGH DENSITY FISH CULTURE.
For primary bibliographic entry see Field 06B.
W72-09522

ELECTRIC POWER AND THE ENVIRONMENT.
Office of Science and Technology, Washington, D.C.
For primary bibliographic entry see Field 06G.
W72-09529

DOSE TO MAN VIA FOOD-CHAIN TRANSFER RESULTING FROM EXPOSURE TO TRITIATED WATER VAPOR,
California Univ., Livermore. Lawrence Radiation Lab.
L. R. Anspaugh, J. J. Koranda, W. L. Robison, and J. R. Martin.
Available from NTIS, Springfield, Va., as UCRL-73195 $3.00 in paper copy; $0.95 in microfiche. Conf. 710809-12. From Tritium Symposium, Las Vegas, Nevada, Aug. 30, 1971, Report no. UCRL-73195, 3, Dec., 1971; 31p.

Descriptors: *Radiation, *Tritium, *Environmental effects, *Model studies, *Ecology, *Food chains, Absorption, Population, Public health, Water vapor, Nuclear explosions, Fallout, Meteorology, Milk, Vegetable crops, Aquatic animals, Path of Pollutants.
Identifiers: Dose prediction, *THO vapor.

A more accurate, but simple model is provided to predict doses to man resulting from food-chain contamination due to exposure to THO vapor. The model is specifically directed to the prediction of dose from the release of THO vapor from a point source, but most of the model is applicable to any THO vapor exposure. Dose commitments via inhalation plus absorption and via the ingestion of vegetables, milk, and meat are considered. The model may be entered with a variety of input data; average values of the parameters needed to evaluate the model are provided, but other values more appropriate to a particular situation may be substituted readily. (Houser-ORNL)
W72-09531

DISPOSAL OF SOLID ALUMINUM PROCESS WASTES IN THE OCEAN,
Pacific Northwest Water Lab., Corvallis, Oreg.
D. J. Baumgartner, R. J. Calloway, and G. R. Ditsworth.
Working Paper No 64, December 1969. 16 p, 2 fig, 3 tab, 7 ref.

Descriptors: *Waste disposal, *Solid wastes, *Pacific Ocean, *Aluminum, Water pollution sources, Dispersion, Columbia River, Currents (Water), Bottom sediments, Industrial wastes, Environmental effects.
Identifiers: *Ocean dumping, Kelly residue.

The probable effect of dumping solid aluminum process wastes at one of three localities in the Pacific Ocean approximately 40 mi off the mouth of the Columbia River is discussed. A description of the material is given and detailed chemical and physical characteristics of each material are given in three tables. Pollution aspects and possible pollution problems are described. Dumping of Kelly residue is to be at a rate of 1000 tons per day for 175 days. In addition, 1000 tons per day of lime mud is to be dumped within an 8-day period. Based on computed settling rates and apparent effect of horizontal dispersion by currents, site two is believed to be the best of the three sites. Located in water about 900 fathoms (1647 m) deep and near the mouth of Willapa Canyon, deep settling material will be funneled seaward from the site. Hydrographic studies of bottom currents and the sedimentation mechanics of this type of disposal method should be made. (Land-USGS)
W72-09552

DESIGN AND CONSTRUCTION OF A SALT-WATER ENVIRONMENT SIMULATOR,
Pacific Northwest Water Lab., Corvallis, Oreg.
W. A. DeBen.
Available from the National Technical Information Service as PB-210 111, $4.00 in paper copy, $0.95 in microfiche. Working Paper No 71, April 1970. 30 p, 6 fig, 4 ref. EPA Program 16070 - 04/70.

Descriptors: *Estuaries, *Water pollution control, *Laboratory equipment, *Model studies, Methodology, Design, Construction, Testing procedures, Eutrophication, Environmental effects, Analytical techniques, Ecological distribution.
Identifiers: Saltwater environment simulator, Test animals.

An experimental, continuous-flow bioassay apparatus was designed to utilize and stabilize salt water derived from an estuarine source. The prototype was constructed to provide a single-test supply of up to 8 liters of water per minute at 4 levels of selected temperature and a near-constant concentration of any selected salinity or dissolved oxygen. Called the 'Saltwater Environment Simulator', this apparatus is intended for use in evaluating pollution effects and natural environmental changes on marine and estuarine animals. The experimental procedure is described and illustrated with drawings of the simulator. Tests indicate that controlled environmental conditions can be provided to define some of the physiological requirements of test animals living under estuarine conditions that can be related to ecological field studies. (Lang-USGS)
W72-09553

SALINITY, RUNOFF AND WIND MEASUREMENTS, YAQUINA ESTUARY, OREGON,
Pacific Northwest Water Lab., Corvallis, Oreg.
R. J. Callaway, G. R. Ditsworth, and D. L. Cutchin.
Available from the National Technical Information Service as PB-210 112, $4.50 in paper copy, $0.95 in microfiche. Working Paper Number 70, March 1970. 42 p, 14 fig, 2 tab, 1 append. EPA Program 16070 - 03/70.

Descriptors: *Hydrologic data, Model studies, Runoff, Water levels, Wind velocity, Meteorology, Salinity, Data processing, Data storage and retrieval, Meteorological data, On-site data collections, Weather data, Estuaries, Oregon.
Identifiers: *Yaquina Bay (Ore), Baseline studies.

The data collection program was intended for two purposes: (1) to provide data for verification of a solution of the advection-diffusion equation, and (2) to provide long, continuous records on which to test certain hypotheses related to time-series analysis. Conductivity data were collected with battery-powered recording conductivity meters. Wind speed and direction data were collected with a Climet wind recording system and a Geodyne wind recorder. Water levels were continuously recorded. An informal summary of data processing techniques and lists of the data available and its present condition are presented. (Svensson-Washington)
W72-09554

ECOLOGICAL DYNAMICS OF WATERSHEDS,
Washington Univ., Seattle. Center for Quantitative Science in Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 02A.
W72-09565

EFFECTS OF MALATHION ON TWO WARM-WATER FISHES AND AQUATIC INVERTEBRATES IN PONDS,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo.
H. D. Kennedy, and D. F. Walsh.
Technical Paper. 55 p 3-13. 1970. Illus.
Identifiers: *Aquatic animals, *Catfishes, *Sunfishes, Chironomidae, Fishes, Insects, *Malathion, Mayflies, Ponds.

Bluegills and channel catfish were exposed to 4 applications of malathion at 2 concentrations in ponds over an 11-wk summer period. Fish losses ranged from 8 to 44% but could not be correlated with treatment levels. Fish growth or microhematocrit values were not significantly different between treated and untreated ponds. Neither acute nor chronic pathology developed, nor were depressions in the brain cholinesterase activity significant or reproducible. Bluegills spawned twice, with approximately 340,000 progeny collected at the conclusion of the study. The first spawn, of approximately 5000, was in early June; the second spawn, in early Aug., approximated 335,000. The total number of aquatic insects from plate sampling the low-treated ponds was not significantly lower than that from the untreated ponds, but the number of organisms from the high-treated ponds was significantly lower than that from either the low-treated or untreated ponds. Chironomidae was the dominant family of aquatic insects, and formed about 70% of the total benthos. This group showed a significant reduction in numbers in both low- and high-treated ponds after the third application of malathion. Baetid mayflies formed about 24% of the benthos and were definitely reduced in both low- and high-treated ponds after third application. Heptageniid mayflies formed about 5% of the benthos and were scarce. They failed to recover after the third treatment. Other groups of insects formed less than 1% of the total benthos. They probably had not become well enough established in these immature ponds to measure significant effects of malathion.--Copyright 1972, Biological Abstracts, Inc.
W72-09567

MECHANISM OF THE INITIAL EVENTS IN THE SORPTION OF MARINE BACTERIA TO SURFACES,
Harvard Univ., Cambridge, Mass. Lab. of Applied Microbiology.
K. C. Marshall, R. Stout, and R. Mitchell.
Journal of General Microbiology, Vol. 68, Part 3, p 337-348, November 1971. 14 fig, 3 tab, 16 ref.

Descriptors: *Sorption, Electrolytes, Sea water, *Pseudomonas, Polymers, Cations, Cultures, Electron microscopy, Nitrogen, Salts, Fouling, *Marine bacteria.
Identifiers: *Achromobacter, Polymers, Glucose, Culture media, Agars.

Colloidal and biological properties of pure cultures of two marine bacteria (the motile Pseudomonas sp. strain R3 and non-motile Achromobacter sp. strain R8) were studied to obtain information on processes involved in their sorption to surfaces. This information may have important ecological implications, as in its relationship to fouling mechanisms. Sorption consists of two phases: (a) reversible, which is an instantaneous attraction and in which the bacteria still exhibit Brownian motion and are easily removed, and (b) irreversible, which involves firm adhesion and absence of Brownian motion. In these studies, reversible sorption of the Achromobacter decreased to zero as the electrolyte concentration decreased, or as the thickness of the electrical double-layer increased. The electrolyte concentration at which all bacteria were repelled from the glass surface depended on the valency of the cation. Reversible sorption often led to rotational motion of the motile Pseudomonas sp. strain R3 at a liquid-glass interface. Pseudomonas R3 produced polymeric fibrils in artificial seawater; these may participate in the irreversible sorption of the bacteria to surfaces. Sorption and polymer production were stimulated by 7 mg/l glucose but higher levels inhibited irreversible sorption. Omission of Ca (2+) and Mg (2+) from the artificial seawater prevented growth, polymer production, and sorption to surfaces by Pseudomonas R3. (Mortland-Battelle)
W72-09568

RELATIONSHIP BETWEEN THE PRODUCTIVITY OF MARINE MOLLUSKS AND THEIR LIFE-SPAN,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
V. Ye. Zaika.
Okenaologiya, Vol. 10, No. 4, p 547-552, 1970. 1 fig, 23 ref.

Descriptors: *Productivity, *Mollusks, Marine animals, *Biomass, Equations, Mathematical studies.
Identifiers: *Macroinvertebrates, *Life span, Mytilus galloprovincialis, Acmaea testudinalis, Mytilaster lineatus, Cardium edule, Abra (equals Syndesmia) ovata, Rissoa splendida, Unionidae, Acmaea digitalis, Dreissena polymorpha, Sphaerium corneum, Bithynia tentaculata, Anisus vortex, Adacna vitrea, Lacuna pallidula, Margarita helicina, Spisula elliptica, Modiolus demissus, Gyraulus albus, Valvata pulchella.

Values of the specific rate of production (C equals the production of a population per unit of biomass per unit of time) were calculated from published data on 21 species of marine and fresh-water mollusks. Using weight increase data, the average specific rate of weight increase (q) was computed for each year of the mollusk's life. Knowing the age structure of a population for a particular moment or period, the daily production (P) could be arrived at from the formula P equals Sigma q sub i B sub i, where B sub i is the biomass of the i-th age group. Computation of C was achieved from the ratio: C equals P/B, where B equals Sigma B sub i. The C of a population is shown to be lower, the longer the life-span of a species. In the mollusks studied, the average daily C measured over a year ranges from 0.0003 to 0.03. (Mackan-Battelle)
W72-09569

EMERGENCE OF CADDISFLIES (TRICHOPTERA) AND MAYFLIES (EPHEMEROPTERA) FROM HEMING LAKE, MANITOBA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. F. Flannagan, and G. H. Lawler.
Canadian Entomologist, Vol. 104, No. 2, p 173-183, February 1972. 2 fig, 2 tab, 23 ref.

Descriptors: *Caddisflies, *Mayflies, *Phenology, *Distribution patterns, Aquatic insects, Sampling, Equipment, Life history studies, Water temperature, Biology, *Canada, Invertebrates, Vertical distribution, Depth.
Identifiers: *Emergence, *Heming Lake (Manitoba), Emergence traps, Substrate types, Ekman grab, Sex ratios, Macroinvertebrates, Neureclipsis bimaculatus, Stenonema interpunctatum canadense, Caenis forcipata, Neureclipsis validus, Nyctiophylax vestitus, Phylocentropus placidus, Polycentropus cinereus, Polycentropus interruptus, Polycentropus remotus, Hydroptila nr rono, Hydroptila salmo, Hydroptila nr scolops, Oxyethira serrata, Oecetis, Triaenodes marginata, Mystacides sepulchralis, Hydropsyche recurvata, Cheumatopsyche analis, Agrypnia straminea, Agrypnia vestita, Phryganea cinerea, Caenis forcipata, Hexagenia limbata, Ephemera simulans, Ephemerella temporalis.

The emergence of caddisflies and mayflies was studied as part of an investigation into organism substrate relationships, phenology, and general biology of the aquatic insect fauna of Lake Heming, Manitoba. Forty-nine 0.1 sq m emergence traps positioned over several substrate types and a range of water depths 0.9 to 5.5 m, from 2 June to 7 September 1967, collected 979 caddisflies and 195 mayflies. The caddisfly emergence was restricted to the period 24 June - 27 August, and mayfly emergence to the period 2-30 July. The sex ratio for the caddisflies showed, in almost every case, a preponderance of females and no male Neureclipsis bimaculatus and N. validus were collected. Most of the caddisflies showed preference for a particular depth and/or substrate type. There is a relationship between depth distribution (temperature) and emergence time for caddisflies. Male Stenonema interpunctatum canadense showed peak emergence about 5 days before the females and also outnumbered the females by about 3:1. No relationship seemed to exist between depth distribution and emergence time for any of the mayfly species. However, the emergence of one species, Caenis forcipata may be related to weather conditions. (Holoman-Battelle)
W72-09570

EMERGENCE TRAP COLLECTIONS OF TRICHOPTERA FROM AN OREGON STREAM,
Oregon State Univ., Corvallis. Dept. of Entomology.
For primary bibliographic entry see Field 05A.
W72-09571

CAPE COD BAY ECOSYSTEM QUANTITATIVE ANALYSIS,
Marine Biological Lab., Woods Hole, Mass. Systematics-Ecology Program.
For primary bibliographic entry see Field 02L.
W72-09573

BIOLUMINESCENCE AND PRIMARY PRODUCTIVITY IN MARINE ESTUARINE ENVIRONMENTS,
Johns Hopkins University, Baltimore, Md. McCollum-Pratt Inst.
H. H. Seliger.
Available from the National Technical Information Service as NYO-3480-18, $3.00 in paper copy, $0.95 in microfiche. Report No. NYO-3480-18, July 1969-May 1971. 26 p. Contract No. AT (30-1)3480.

Descriptors: *Estuarine environment, *Bioluminescence, *Plankton, *Biomass, *Primary productivity, Ecological distribution, Aquatic

populations, Dinoflagellates, Phytoplankton, Zooplankton, Cultures, Secondary productivity, Aquatic environment, Diatoms, Eutrophication, Rotifers, Copepods, Environmental effects, Chlorophyll, Spectrophotometry, Sampling, Systematics, Protozoa, Turbidity, Physical properties, Nannoplankton, Water analysis, Plant pigments, Succession, Larvae, Surveys, On-site data collections, Standing crop, Fluorometry, Spectrophotometry, Carbon, Nitrogen, Phosphorus, Nitrates, Nitrites, Phosphates, Temperature, Chemical properties, Salinity, Nutrients.
Identifiers: Gonyaulax spinifera, Gonyaulax fragilaris, Gymnodinium flavans, Gymnodinium nelsoni, Gymnodinium splendens, Ceratium furca, Peridinium conicum, Peridinium pentagonium, Polykrikos hardmanni, Polykrikos schwarzi, Pyrodinium bahamense, Gonyaulax polyedra, Gonyaulax catanella, Pyrocystis lunula, Pyrocystis pseudonoctiluca, Pyrocystis fusiformis, Noctiluca miliaris, Gymnodinium nelsoni.

Studies of bioluminescent bays in Jamaica (West Indies) and Puerto Rico show that increased nutrient levels and man's intervention are major factors contributing to the instability of native bioluminescent phytoplankton populations and the emergence of unidentified and foreign bioluminescent species. In the Rhode and West Rivers and a contiguous portion of the Chesapeake Bay, a plankton survey with extensive sampling was conducted in 1969 to determine (a) types and numbers, (b) temporal and spatial distributions, and (c) productivity of zoo- and phytoplankton as well as their interactions with each other and the physical environment. Throughout the survey, temperature, salinity, and Secchi disc measurements were made. Sample analysis included plankton enumeration, spectrophotometric chlorophyll and pheopigment estimates, and bioluminescence confirmations. In 1970, the sampling and analysis program was modified to include fluorometric, chlorophyll, and pheophytin estimates, total C, N, P and inorganic C, NO2, NO3, PO4 measurements, and unialgal laboratory cultures of 25 species of phytoplankton. It was concluded that: (1) correlations among chlorophyll a standing crops, temperature, and Secchi disc turbidities are perturbed by nutrient pulses due to runoff; (2) bioluminescence is at a very low level except during large dinoflagellate concentrations in the fall; (3) 80-90 percent of standing crop and productivity is due to nannoplankton except when dinoflagellates increase; and (4) zooplankton concentrations seem to be phased with production pulses at various times of the year. (Synder-Battelle)
W72-09575

NITROGEN FIXATION BY BACTERIA IN LAKE MIZE, FLORIDA, AND IN SOME LACUSTRINE SEDIMENTS,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
M. A. Keirn, and P. L. Brezonik.
Limnology and Oceanography, Vol 16, No 5, p 720-731, September 1971. 5 fig, 6 tab, 21 ref. FWQA Program 16010 DCK.

Descriptors: *Nitrogen fixation, *Clostridium, *Sediments, Estuarine environment, Cultures, Nitrogen, Photosynthesis, Photosynthetic bacteria, Estuaries, Carbohydrates, Cellulose, Methodology, Aquatic environment, Reduction (Chemical), Aquatic microorganisms, Anaerobic bacteria, Gas chromatography, Chemical analysis, Phosphates, Incubation, Seasonal, Stratification, Thermal stratification, *Florida.
Identifiers: *Acetylene reduction, *Heterotrophic bacteria, Enrichment, Ethylene, Molecular nitrogen, Lake Kanapaha, Sucrose, *Lake Mize, Thiospirillum, Chromatium, Lake Mary, Eubacteriales, Athiorhodaceae, Thiorhodaceae, Lake Alice, Hypolimnion, Autotrophic bacteria, Lake Orange, Lake Kanapaha, Lake Bivins Arm, Lake Moss Lee, Lake Apopka, Lake Griffin, Lake Eustis, Lake Hawthorne, Lake Wauberg, Newnans Lake, Cooter Pond, Lake Lochloosa, Calf Pond, Watermelon Pond, Lake Jeggord, Lake Altho, Anderson-Cue Lake, Lake Gallilee, Lake Cowpen, Sand Hill Lake, Swan Lake, Culture media, Lake Clear.

Samples of water from Lake Mize and a variety of lacustrine sediments were incubated and analyzed for nitrogen fixation by acetylene reduction. The samples were purged with helium and incubated in a water-bath shaker at 22 C. Aerobic samples were incubated under fluorescent lights; the remainder were incubated in the dark. Control samples were run simultaneously. Ethylene was determined with a Varian-Aerograph 600D gas chromatograph. Results show a consistent seasonal and vertical pattern of fixation occurs in Lake Mize with positive rates noted only for a relatively short period during summer stratification and only in the anoxic hypolimnion. Maximum rates (up to an equivalent of 3.26 micrograms N/liter-hr) were at depths of 5-10 m (D max equals 25 m) and three bacterial cultures capable of fixing nitrogen were isolated from the waters: a heterotroph characteristic of the genus Clostridium and the purple sulfur bacteria Thiospirillum and Chromatium. Available evidence suggests that fixation is primarily heterotrophic. Acetylene reduction was detected in sediments of 7 of 25 Florida lakes and in sediments from 3 Guatemala lakes. Rates decreased with depth in 30-50 cm cores. High concentrations of sucrose stimulated acetylene reduction in lake sediment, but glucose, acetate, butyrate, and pyruvate did not. (Snyder-Battelle)
W72-09579

TOXICITY ASSESSMENT OF TREATED MUNICIPAL WASTEWATERS,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 05D.
W72-09582

PROBLEMS IN WATER TOXICOLOGY (VOPROSY VODNOY TOKSIKOLOGII).

'Nauka', mMoscow, 1970. 224 p.

Descriptors: *Hydrobiology, *Pathology, *Toxicity, *Water quality control, *Water pollution effects, Water pollution sources, Aquatic life, Aquatic animals, Aquatic microorganisms, Aquatic plants, Aquatic algae, Pesticides, Insecticides, Herbicides, Phosphorus, Phenols, Metals, Pollutants, Industrial wastes, Conferences.
Identifiers: *USSR, *Toxicology, *Toxicants, *Hydrobionts, Ichthyology, Ichthyofauna, Macrophytes, Saprophytes, Cerium.

This collection of 37 papers contains reports presented at the All-Union Conference on Problems in Water Toxicology, held in Moscow January 30 to February 2, 1968. The book is divided into 5 sections: (1) general problems in water toxicology (10 papers); (2) effects of pesticides on hydrobionts (8 papers); (3) effects of phosphorus and phosphorus compounds on hydrobionts (6 papers); (4) effects of phenols on hydrobionts (7 papers); and (5) effects of metals and metallic compounds on hydrobionts (6 papers). Samples collected for analysis included bacteria, algae, and a variety of invertebrates and fishes. Changes in biological processes in sea water and freshwater under influence of different pollutants and industrial wastes were examined together with methods for future investigation of the toxicity of the aquatic environment. (See W72-09647 thru W72-09652) (Josefson-USGS)
W72-09646

WATER POLLUTION AND PROBLEMS IN WATER TOXICOLOGY (ZAGRYAZNENIYE VOD I ZADACHI VODNOY TOKSIKOLOGII),
Moscow State Univ. (USSR).
N. S. Stroganov.
In: Voprosy vodnoy toksikologii; 'Nauka', Moscow, p 11-23, 1970.

Descriptors: *Hydrobiology, *Toxicity, *Water pollution, *Water pollution control, *Water pollution sources, Water pollution effects, Water quality control, Water quality standards, Legal aspects, Public health, Industries, Lumbering, Pollutants, Waste water (Pollution), Planning.
Identifiers: *USSR, *Toxicology, *Toxicants, *Hydrobionts.

Problems in water toxicology in connection with increasing pollution of surface waters are defined and measures are formulated to curb deterioration in water quality. The problems examined fall into 3 general categories: (1) practical problems, demanding immediate attention; (2) theoretical problems, arising out of long-term study of the ecological physiology and biochemistry of hydrobionts; and (3) organizational problems, requiring solution to keep abreast of practical and theoretical considerations. Legal, medical, industrial, and biological aspects of water quality are examined together with the principal sources of pollutants in water. (See also W72-09646) (Josefson-USGS)
W72-09647

PRESENT STATE AND DEVELOPMENT OF SCIENTIFIC RESEARCH ON PREVENTION OF FISHERY POLLUTION (SOSTOYANIYE I PERSPEKTIVY NAUCHNO-ISSLEDOVATEL'SKIKH RABOT PO PROBLEME OKHRANY RYBOKHOZYAYSTVENNYKH VODOYEMOV OT ZAGRYAZNENIYA),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
A. G. Gusev.
In: Voprosy vodnoy toksikologii; 'Nauka', Moscow, p 24-33, 1970. 1 fig, 22 ref.

Descriptors: *Water quality control, *Water quality standards, *Water pollution effects, *Aquatic life, *Fisheries, Stream fisheries, Lake fisheries, Reservoir fisheries, Estuarine fisheries, Fish establishment, Toxicity, Toxins, Pesticides, Pollutants, Industries, Industrial wastes, Environmental sanitation, History, Investigations.
Identifiers: *USSR.

A review of investigations concerned with water-quality control of fisheries developed in rivers, lakes, reservoirs, and estuaries of the USSR is presented. A scheme for detailed analysis of the effects of industrial wastes on fisheries and hydrobionts was based on long-term investigations by the Leningrad State Scientific Research Institute of Lake and River Fisheries. Plans are envisaged for expanded studies of the effects of polluting substances produced by man's industrial, domestic, and agricultural activities. (See also W72-09646) (Josefson-USGS)
W72-09648

DETERMINATION OF THE TOXICITY OF CONTAMINATED FRESHWATER WITH RESPECT TO CERTAIN HYDROBIONTS (OPREDELENIYE TOKSICHNOSTI ZAGRYAZNENNYKH PRESNYKH VOD V OTNOSHENII NEKOTORYKH GIDROBIONTOV),
Moscow State Univ. (USSR).
G. D. Lebedeva.
In: Voprosy vodnoy toksikologii; 'Nauka', Moscow, p 57-61, 1970. 2 fig, 10 ref.

Descriptors: *Hydrobiology, *Toxicity, *Water pollution, *Freshwater, *Aquatic life, Aquatic animals, Carp, Daphnia, Aquatic plants, Aquatic algae, Scenedesmus, Radioisotopes, Strontium radioisotopes, Phosphorus radioisotopes, Cesium, Radioactivity effects, Laboratory tests.
Identifiers: *USSR, *Hydrobionts, *Cerium, Radiometry.

The effects of radioactive elements on biological functions of hydrobionts were based on laboratory analyses of fish (Cyprinus carpio), crustaceans (Daphnia magna), higher aquatic plants (Lemna

minor and Elodea canadensis), and green algae (Scenedesmus quadricauda). The radioactive isotopes used were Sr-90, Sr-89, Cs-137, Ce-144, and P-32. Plant organisms, which concentrate large amounts of radioactive strontium, are less sensitive to water contamination by this element. Of the animal organisms examined, Daphnia are the most sensitive to water contamination by radiostrontium. The toxicity criteria for fish were the growth rate and amount of edible food; for Daphnia--the survival rate, reproduction and fertility; and for aquatic plants--the population and increase in the biomass. (See also W72-09646) (Josefson-USGS)
W72-09649

PROBLEM OF PESTICIDES IN WATER TOXICOLOGY (PROBLEMA PESTITSIDOV V VODNOY TOKSIKOLOGII),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
L. P. Braginskiy.
In: Voprosy vodnoy toksikologii; 'Nauka', Moscow, p 81-88, 1970. 2 fig, 3 tab, 4 ref.

Descriptors: *Hydrobiology, *Pesticides, *Pesticide residues, *Pesticide toxicity, *Aquatic plants, Aquatic algae, Phytoplankton, Aquatic microorganisms, Aquatic animals, Daphnia, Application methods, Granules, Plant growth regulators, Inhibitors, Herbicides, Monuron, Photosynthesis.
Identifiers: *USSR, *Toxicology, *Hydrobionts, Macrophytes, Saprophytes.

Pesticides in an aquatic environment affect hydrobiological processes by (1) altering the habitats of hydrobionts by inhibiting plant photosynthesis (oxygen depletion) and by stimulating saprophyte growth; (2) acute poisoning of hydrobionts by toxic concentrations of pesticides; and (3) producing a variety of acute and chronic effects on hydrobionts by the presence of pesticide residues accumulated through food chains. Prospects for the use of pesticides to regulate algal and macrophyte growth are based primarily on the application of granules to plant protection. Methods are given for studying the effects of pesticides on water bodies and on the biological processes occurring in them. (See also W72-09646) (Josefson-USGS)
W72-09650

EFFECTS OF PESTICIDES ON THE LIFE OF A WATER BODY (K VOPROSU O VLIYANII PESTITSIDOV NA ZHIZN' VODOYEMA),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
K. K. Vrochinskiy, and N. E. Kononova.
In: Voprosy vodnoy toksikologii; 'Nauka', Moscow, p 88-96, 1970. 3 tab, 26 ref.

Descriptors: *Hydrobiology, *Pesticides, *Pesticide residues, *Pesticide toxicity, *DDT, Emulsions, Chemicals, Insecticides, Fish, Fish physiology, Fishkill, Zooplankton, Aquatic plants, Bottom sediments, Bodies of water, Aquaria, Ponds, Water quality, Chemical analysis.
Identifiers: *USSR, *Siberia, Angara River, Ilim River, Hydrobionts.

Pesticide research conducted in 1966 on the Angara and Ilim Rivers in south-central Siberia focused on a study of the accumulation of DDT and other chemicals in fishes, aquatic plants, and bottom sediments. The amounts of DDT in fishes, zooplankton, and bottom sediments were considerably higher than those in water. The accumulation of DDT residue was several orders higher in aquatic plants than in water and averaged 1.85 mg/kg. Fish contained up to 5.86 mg/kg DDT in gills, 5.14 mg/kg in kidney tissues, 4.18 mg/kg in liver, and 3.71 mg/kg in fat. The DDT residue levels in muscle tissues were 0.86 mg/kg. Chronic pesticide accumulations impair the nutrient availability of water bodies and decelerate the growth rates of fish. (See also W72-09646) (Josefson-USGS)
W72-09651

EFFECTS OF DDT AND HEXACHLOROCYCLOHEXANE ON AQUATIC ANIMALS (K VOPROSU O VLIYANII DDT I GEKSAKHLORANA NA VODNYYE ORGANIZMY),
Dnepropetrovskii Gosudarstvennyi Universitet (USSR). Institut Gidrobiologii.
I. P. Lubyanov.
In: Voprosy vodnoy toksikologii; 'Nauka', Moscow, p 102-106, 1970. 6 ref.

Descriptors: *Hydrobiology, *Water pollution effects, *Aquatic animals, *Aquatic insects, *DDT, Insecticides, Pesticides, Pesticide drift, Dusts, Application methods, Toxicity, Water chemistry, Water properties, Organoleptic properties, Lakes, Aquaria.
Identifiers: *USSR, *Dnieper River, *Toxicology, Hexachlorocyclohexane, Hydrobionts, Ichthyofauna.

Hydrobiological and toxicological investigations were conducted on 4 floodplain lakes of the Lower Dnieper to study the effects of DDT and hexachlorocyclohexane on the fauna and regime of the water bodies. To control mosquitoes, the lakes were treated aerially by dusting with a 10% solution of DDT in doses ranging between 2.5 and 20 kg/ha and with a 12% solution of hexachlorocyclonexane in doses ranging between 6 and 24 kg/ha, both in triple application. At a maximum dose of 24 kg/ha, the concentration of insecticides in the lake water varied between 0.05 and 2.4 mg/liter. Treatments at these dosage levels produced changes in the organoleptic properties of water and in the hydrochemical and hydrobiological regimes of the lakes. Eradication of large numbers of adult, sexually mature insects was recorded together with elimination, under aquarian conditions, of crustaceans of the gammarid and mysid types. (See also W72-09646) (Josefson-USGS)
W72-09652

POSSIBLE EFFECTS OF ORGANOCHLORINE PESTICIDES ON PRIMARY PRODUCTIVITY AND SKELETOGENESIS OF NEW ENGLAND ESTUARINE AND COASTAL MARINE ALGAE,
Massachusetts Univ., Amherst. Water Resources Research Center.
J. P. Sears, and C. Yentsch.
Available from the National Technical Information Service as PB-210 146, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, February 1972. 13 p, 6 fig, 2 ref. OWRR A-035 Mass. (1).

Descriptors: *Analytical techniques, Rates, *Photosynthesis, *Marine algae, DDT, *Pesticides, *Primary productivity, Water pollution effects, Estuarine environment.
Identifiers: Rhodymenia, Fucus, Ulva.

Techniques have been developed to estimate rates of photosynthesis in macroscopic marine algae by monitoring oxygen production. Attempts to use 14C techniques were unseccessful because of the difficulty of recovering assimilated 14C by maceration, acid hydrolosis and strong base solubilization of thalli. The problem of 14C recovery would be solved if the plant material could be completely combusted and total carbon recovered in ethanolamine. Base line data on the influence of temperature and light intensity on rates of photosynthesis were obtained for Rhodymenia, Fucus and Ulva. Photosynthesis by macroscopic algae was strongly influenced by water movement. Under conditions of standing water, oxygen production decreased to a fraction of oxygen production in a stirred system. The reduced rate of photosynthesis was probably due to depletion of CO2 at the thallus surface, and a subsequent rise in pH. Future estimates of photosynthesis in macroalgae should include some mechanism for water agitation, especially during estimates of productivity. The effect of DDT on photosynthesis of Rhodymenia, Fucus and Ulva could not be consistently demonstrated. If any effect did occur, its magnitude was below the level of detection because of the photosynthetic variability among plants. These findings are in contrast to the pronounced effects of DDT on phytoplankton photosynthesis reported by Menzel, 1970; and Wurster, 1969.
W72-09653

PHOSPHORUS AND EUTROPHICATION IN THE PAMLICO RIVER ESTUARY, N. C., 1966-1969 - A SUMMARY,
North Carolina Water Resources Research Inst., Raleigh.
B. J. Copeland, and J. E. Hobbie.
Available from the National Technical Information Service as PB-210 158, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute Report No 65, March 1972. 86 p, 18 fig, 20 tab, 49 ref. OWRR B-004-NC.

Descriptors: *Eutrophication, *Trophic levels, *Nutrients, *Estuarine environment, *Phosphorus, North Carolina, Hydrography, Water pollution effects, Phytoplankton, Nitrogen, Biomass, Stratification.
Identifiers: *Pamlico River estuary (N.C.).

The effects of phosphorus on the ecology of the Pamlico River Estuary, N.C. were measured. Surveys were conducted to determine hydrography, phosphorus concentrations in the water and sediment, and phytoplankton speciation and biomass in relation to inputs from the Tar River Basin and phosphorus mining activities. Studies were designed to determine phytoplankton response to phosphorus additions, phosphorus exchange with sediment, phosphorus utilization by Rangia clams, and phosphorus uptake by phytoplankton. The Pamlico River Estuary is typically oligo- to mesohaline; tidal influence is minimal and the estuary occasionally stratifies. Stratification is easily destroyed by winds. During summer stratification, anaerobic conditions develop near the bottom muds. The estuary already is rich in phosphorus, and concentrations are increasing via land runoff and mining wastes. Much of the incoming phosphorus accumulates in the bottom sediments. The annual cycle of phytoplankton numbers and biomass in the Pamlico River Estuary is similar to that found in other similar east-coast estuaries. Experimentation revealed that mud would remove significant amounts of dissolved reactive phosphorus from the water column. Release of phosphorus from mud occurs under low oxygen conditions. Experiments revealed that phosphorus additions did not cause increased carbon uptake; whereas, nitrogen additions resulted in significant increases. Nitrogen is the limiting major nutrient in the Pamlico River Estuary.
W72-09655

ENERGETICS OF NATURAL POPULATIONS OF FRESHWATER MACROCONSUMERS,
Michigan State Univ. Hickory Corners. W.K. Kellogg Biological Station.
K. W. Cummins.
Available from the National Technical Information Service as COO-2002-4, $3.00 in paper copy, $0.95 in microfiche. October 1, 1969 - July 31, 1970. 21 p, 9 fig, 1 tab. Contract No. AT (11-1)-2002.

Descriptors: *Herbivores, *Carnivores, *Energy budget, *Bio-energetics, Benthic fauna, Ecosystems, Aquatic animals, Fresh water, *Ingestion, Trophic level, Respiration, Comparative productivity, Aquatic productivity, Benthos, Primary productivity, Nutrients.
Identifiers: Energy flow, Nutrient cylcing, Macroconsumers, *Egestion, *Assimilation, Ingestion, Glossosoma nigrior, Neophylax oligius, Nigromia serricornis, Leptodora Kindtii, Daphnia pules, *Detritivores.

Since population energy budget determinations require the processing of extensive amounts of diverse data, and a great many populations must

be analyzed before a useful budget estimate at the system level can be obtained, automation of certain aspects of data gathering and analysis is critical. The primary methodological objective has been to establish a procedural package for determining energy budgets for natural populations of freshwater macroconsumers. The macroconsumers selected represent different trophic levels and habitats. The lotic benthic herbivore Glossosoma nigrior, ditritivore Neophylax digius, and carnivore, Nigronia serricornis and the lentic planktonic herbivore Daphnia pulex and carnivore Leptodora kintii constitute the natural populations investigated by both field and laboratory techniques. Parameters investigated included ingestion (gut loading) rates; assimilation (tissue loading); egestion (gut unloading) rates; respiration, and production rates. Methods are shown for determining each of the parameters; however no results are included. (Mackan-Battelle)
W72-09666

THE RATE OF LOSS OF MERCURY BY PACIFIC OYSTERS,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05A.
W72-09667

THE RELATIONSHIPS BETWEEN 32P ACCUMULATION IN ALGAE, BACTERIA AND TUBIFICIDS,
Western Michigan Univ., Kalamazoo, Dept. of Biology.
W. L. Stromberg, and C. J. Goodnight.
Available from the National Technical Information Service as COO-1803-6, $3.00 in paper copy, $0.95 in microfiche. Final Report 1970. 27 p, 8 fig, 2 tab, 18 ref. Contract No. AT (11-1)-1803.

Descriptors: *Phosphorus radioisotopes, *Tubificids, *Food chains, *Path of pollutants, *Absorption, Algae, Chorella, Tracers, Phosphates, Ecosystems, Aquatic life, Antibiotics (Pesticides), Ecology, Benthos, Invertebrates, Phytoplankton, Plankton, Water temperature, E. coli, Benthic fauna, Cellulose, Enzymes, Pulp wastes, Radioecology, Water pollution, Phosphorus, Water temperature, Hydrogen ion concentration, Nutrients, Radioisotopes, Algae, Water quality, Annelids, Adsorption.
Identifiers: *Chlorella pyrenoidosa, *Chloramphenical, Limnodrilus spp., Tubifex, Unialgal cultures, Ouabain, Biological magnification, Phosphorus-32, Limnodrilus.

Kinetics of accumulation and retention of P-32 were determined for unialgal cultures of Chlorella pyrenoidosa in carrier (52 mg Na2HPO4/1.) and carrier-free Knop's solution (modified) using 10 microcuries P-32/1 as tracer and a Geiger-Mueller counting system. The number of counts was sufficient to assure accuracy within 5 percent. Accumulation in a carrier-free solution was exponential and approached a 90 percent efficiency of removal within 30 minutes. In the carrier solution, accumulation was approximately linear and did not reach equilibrium within a 27-hour period. Using ouabain as an inhibitor, it was shown that the observed sorption of radiophosphate in carrier-free solution by this alga was independent of metabolic activity. Most loss of the phosphate taken up in a 27-hour interval occurred within one hour in agitated carrier and carrier-free Knop's solution. Accumulation of P-32 by tubificid worms was also studied using similar counting methods. Uptake by these worms was approximately exponential in media with a bacterial source of radiosphsphate, and was reduced by addition of chloramphenicol and removal of P-32 from solution by algae. Preliminary results indicated that C. pyrenoidosa competed effectively with the worms for inorganic phosphate, and that accumulation of P-32 by ingestion of algae among tubificids may be slight. The ecological implications of these results are discussed. (Jefferis-Battelle)
W72-09668

COLUMBIA RIVER STUDIES, ANNUAL PROGRESS REPORT 1970-1971,
Washington Univ., Seattle. Coll. of Fisheries; and Washington Univ., Seattle. Lab. of Radiation Ecology.

Available from the National Technical Information Service as RLO-2225T-1-8, $3.00 in paper copy, $0.95 in microfiche. June 30, 1971. 11 p, 1 fig, 4 tab. Contract No. AT (45-1)-2225-T1.

Descriptors: *Columbia River, *Radioisotopes, *Nuclear wastes, *Radioactivity effects, Oysters, Thermal pollution, Primary productivity, Phytoplankton, Heavy metals, Bottom sediments, Sampling, Zinc radioisotopes, Diatoms, Clams, Absorption, Water temperature, Water pollution effects, Photosynthesis, Mussels.
Identifiers: Sample preservation, Chlamydomonas reinhardi, Monochrysis lutheri, Lake Washington, Puget Sound, Mercury radioisotopes, Dosimeters, Baker Bay, Willapa Bay, Juan de Fuca Strait, Big Beef Creek, Scandium radioisotopes, Zirconium radioisotopes, Columbium radioisotopes, Copalis Beach, Razor clams, Thermoluminescence, Chromium radioisotopes, Zinc 65, Chromium 51.

Several programs to monitor the presence of radioisotopes in the marine environment of the Columbia River and to measure the radiation dose in sediments near the mouth of the Columbia are summarized. The programs involved both field studies and laboratory programs in which the effects of radiation and temperature stresses on oyster larvae and phytoplankton were evaluated. The six separate programs were: Effects of temperature and ionizing radiation on young oysters; Effects of temperature and ionizing radiation on primary production in the aquatic environment; Biological half-life for zinc and mercury in oysters; Zinc-65 - Mussel monitoring program; Dose measurements with thermoluminescent dosimeters; and Concentration factors and specific activity values for chromium-51 and zinc-65 for selected organisms. (Mortland-Battele)
W72-09670

SUMMER CONFERENCE OF SOCIETY FOR APPLIED BACTERIOLOGY, LIVERPOOL, 13--15 JULY 1971,
Office of Naval Research, London (England).
G. A. Hottle.
Available from the National Technical Information Service as AD731-726, $3.00 in paper copy, $0.95 in microfiche. Report No. ONRL-C-19-71, 31 August 1971. 12 p, 11 ref.

Descriptors: *Microorganisms, *Water pollution control, *Wastes, *Pathogenic bacteria, Conferences, *Public health, Rivers, *Sewage, Biochemical oxygen demand, Solid wastes, Ammonia, Nitrogen compounds, Nitrates, Phosphates, Sludge treatment, Dissolved oxygen, Bacteria, Fungi, Protozoa, Fermentation, Bacteriophage, Nutrients, Filters Equipment, Oxidation, Lakes, Wisconsin, Anaerobic digestiion, Algae, Eutrophication, Biodegradation, Plastics, Phosphorus compounds, Soil fungi, Pseudomonas, Dairy industry, Municipal wastes, Herbicides, Soil bacteria, Pesticides, Industrial wastes, DDT, Trace elements, Water quality, Detergents, Farm wastes, Urine, Aerobic bacteria, Carbohydrates, Bactericides, Clostridium, Streptococcus, Salmonella, Water purification, Sheep, Yeasts, Foods, Anaerobic bacteria, Soil contamination, Waste treatment, Organic matter, Digestion, Activated sludge, Actinonycetes, Hydrocarbon pesticides, Viruses, Water pollution sources, Water pollution effects, Path of pollutants.
Identifiers: Bdellovibrid, Pelodictyon, Polioviruses, Plasticizers, Phthalate, Thermophilic fungi, Polyethylene, Polypropylene, Bacillus, Corynebacteria, Streptothrix hyorhina, Cadmium, Dimethylnitrosamine, Amines, Carcinogens, Torulopsis spp., Aspergillus, Penicillium, Fusaria, Vibris.

The annual conference of the Society for Applied Bacteriology, held at the University of Liverpool, 13-15 July 1971, included a two-day symposium on 'Microbiol Aspects of Pollution' and a one-day session devoted to papers on individual research. The following topics were discussed: (1) water pollution by domestic, agricultural and industrial wastes, (2) sewage treatment using combined aerobic-anaerobic systems, (3) microbial ecology of the activated sludge process, (4) microbial aspects of pollution in the food and dairy industry, (5) pollution of freshwaters with inorganic nutrients, (6) microbial degradation of plastics, herbicides, and pesticides, (7) aerobic methods for the treatment of farm wastes, (8) factors affecting algal blooms, (9) the role of obligate anaerols in the digestion of organic material, (10) health hazard of pollution, and (11) sewage pollution of natural waters. Individual research topics included (1) 'An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge', (2) 'The Microbial Pollution of Water Courses as a result of the Sewage and Animal Wastes and the Application of Animal Slurry to Land', and (3) 'Methods for Analyzing the Microbial Decay of Solid Wastes'. (Jefferis-Battelle)
W72-09675

LABORATORY RELEASE RATE STUDIES OF DURSBAN-POLYMERIC FORMULATIONS, MARCH-JULY 1970,
Army Environmental Hygiene Agency, Edgewood Arsenal,
For primary bibliographic entry see Field 05B.
W72-09676

EFFECTS OF PETROLEUM FRACTIONS ON THE EARLY DEVELOPMENT OF A SEA URCHIN,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
H. Allen.
Marine Pollution Bulletin, Vol. 2, No. 9, p 138-140, September 1971. 3 tab, 4 ref.

Descriptors: *Bioassay, *Oil pollution, *Toxicity, *Fuels, *Oil, Lethal limit, Organic compounds, Oily water, Water pollution effects, Bioindicators, Oil spills, Oil wastes.
Identifiers: *Hydrocarbon toxicity, *Sea urchins.

Toxicity tests with water soluble extracts of a number of crude and refined oil products show that although they have little harmful effect on fertilization, most are highly toxic to the developing sea urchin eggs. The sensitivity of the early development of this animal to water soluble components of 16 petroleum products has been tested. Fertilization was generally less sensitive to the toxic effects of oils than was cleavage. Crude oils and heavy bunker oils were more inhibiting to normal development than were the more highly refined petroleum products, possible because the process of refining removes many of the more toxic fractions. Many of the oil samples that had the greatest toxic effect on fertilization had less toxic effect on cleavage, and vice-versa. (LeGore-Washington)
W72-09677

KEROSENE-LIKE TAINTING IN AUSTRALIAN MULLET,
Australian Wine Research Inst., Glen Osmond.
D. W. Connell.
Marine Pollution Bulletin, Vol. 2, p 188-190, 1971. 1 fig, 16 ref.

Descriptors: *Mullets, *Australia, *Taste, Water pollution effects, Absorption, Fish physiology, Biology, Fish management, Organoleptic properties, Organic compounds, Water quality.
Identifiers: *Kerosene pollution, *Fish tainting, *Seafood tainting, *Hydrocarbon pollution, Seafood.

Various types of tainting can occur in mullet and during recent years reports have been obtained in South Queensland of a taint with a distinctive kerosene odor or flavor. Investigations to the present time have shown that the tainting is due to the presence of hydrocarbons in the flesh. Mullet previously have been demonstrated capable of absorption of kerosene in the water. The Brisbane River in South Queensland was surveyed for the presence of potentially relevant contaminants. Two areas were implicated. One is near a petroleum refinery and the other is located near a sewage outfall. Sediment samples for these stations contained the homologous series of n-alkanes from n-octane to n-pentadecane. The gas chromatograph of this substance is similar to that of commercial kerosen. (LeGore-Washington)
W72-09678

THE EFFECTS OF PH, SOLUBILITY AND TEMPERATURE UPON THE ACUTE TOXICITY OF ZINC TO THE BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS RAF.),
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
J. J. Cairns, T. K. Bahns, D. T. Burton, K. L. Dickson, and R. E. Sparks.
Transactions of the Kansas Academy of Science, Vol. 74, No. 1, p 81-92, 1971. 2 fig, 4 tab, 11 ref.

Descriptors: *Zinc, *Toxicity, *Water pollution, Water pollution effects, Lethal limit, Metals, Sunfishes, Bioassay, Hydrogen ion concentration, Solubility, Water temperature.
Identifiers: Lepomis spp., Metal toxicity.

Bluegill sunfish were exposed for 96 hr under static test conditions to water soluble ZnSO4.7H20 and water insoluble Zn3 (PO4)2.4H20 at two temperature ranges (21-24 C; 7-9 C) and two pH ranges (5.7-7.0; 7.3-8.8). Control fish were maintained in water containing no zinc. No bluegills died in water containing insoluble zinc in amounts comparable to the amounts of soluble zinc (13.50, 18.00, 24.00, and 32.00 mg Zn (++)/1) which produced mortalities of 90-100%. Bluegill mortalities in concentrations of soluble zinc ranging from 10 to 32 mg (Zn (++)/1) were 0-10% at the high pH, while at the low pH mortalities were 100%. Bluegills at the low temperatures died at a much slower rate, and the time-to-death of the first fish was considerably delayed, in comparison to bluegills at the warmer temperature. Continuous flow bioassay tests in which two types of test containers were used showed differences in 96 hr TL-m values. There were small differences in TL-m values, which should be of interest to other workers using bioassays. (Svensson-Washington)
W72-09679

POLYCHLORINATED BIPHENYLS AND DDT ALTER SPECIES COMPOSITION IN MIXED CULTURES OF ALGAE,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
J. L. Mosser, N. S. Fisher, and C. F. Wurster.
Science, Vol. 176, No. 4034, p 533-535, 5 May 1972. 1 fig, 26 ref. Project No. NIH 1F02ES48112-01, NSF GB-11902.

Descriptors: Water pollution effects, *DDT, *Chlorinated hydrocarbon pesticides, *Polychlorinated biphenyls, *Balance of nature, *Biological communities, *Dominant organisms, Organic pesticides, Pesticide toxicity, Chlorophyta, Chrysophyta, Bioindicators, Ecological distribution, Bioassay, Pesticide kinetics.
Identifiers: *Algal community imbalance, *Imbalance of communities, Thalassiosira spp., Dunaliella spp.

Either DDT or polychlorinated biphenyls (PCB's) were added to mixed cultures containing a marine diatom and a marine green alga that were sensitive or resistant, respectively, to these organochlorine compounds. The diatom grew faster and was therefore dominant in control cultures, but its dominance diminished in treated cultures, even at concentrations of chlorinated hydrocarbons that had no apparent effect in pure cultures. Such stable pollutants could disrupt the species composition of phytoplankton communities, thereby affecting whole ecosystems. (LeGore-Washington)
W72-09680

ECOLOGY OF THE EPIPELIC ALGAL COMMUNITIES IN MARION LAKE, BRITISH COLUMBIA,
State Univ. Coll., Plattsburgh, N.Y.
G. K. Gruendling.
Journal of Phycology. Vol 7, No. 3, p 239-249. 1971. Illus.
Identifiers: *Algal, British Columbia, Canada, *Biological communities, Crops, Ecology, Epipelic, Grazing, Lakes, Light, *Marion Lake (B.C.), Nutrients, Primary productivity, Temperature.

Studies of the seasonal and spatial distribution of the epipelic algal standing crop and primary productivity were conducted. Possible biological, chemical and physical factors controlling the epipelic algal community dynamics were also investigated. The epipelic algal flora of the lake was very diverse, however, it can be generally considered as acidophilic associations of algae. The vertical distribution of the epipelic algae is particularly influenced by the amount of light reaching the sediment, but also strongly influenced by the grazing of animals and erosion by wave action. Temperature, light and grazing by animals all appear to influence the seasonal fluctuations in the algal standing crop. Concentrations of nutrients immediately above the sediment surface appear to be less important as controlling factors. The most important variables influencing the primary productivity of the epipelic community are temperature, total algal standing crop and light. Nutrients, again, appear to be less important as controlling factors. The study supports the idea that epipelic algal growth is high in shallow, low nutrient lakes and that the epipelic algal productivity is extremely important to the total energy budget of the lake.--Copyright 1972, Biological Abstracts, Inc.
W72-09681

THE SANTA BARBARA OIL SPILL PART 1: INITIAL QUANTITIES AND DISTRIBUTION OF POLLUTANT CRUDE OIL,
California Univ., Santa Barbara, Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W72-09682

THE SANTA BARBARA OIL SPILL PART 2: INITIAL EFFECTS ON INTERTIDAL AND KELP BED ORGANISMS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
M. Foster, M. Neushul, and R. Zingmark.
Environmental Pollution, Vol. 2, p 115-134, 1971. 10 fig, 3 tab, 19 ref. FWPCA 14-12-516 NSF GB 5952 and GH43.

Descriptors: *Oil pollution, *Oil spills, *Water pollution effects, Water pollution sources, Kelps, Lethal limit, Mortality, Toxicity, Oily water, Crabs, Mussels, Aquatic animals.
Identifiers: *Santa Barbara (Calif), Barnacles, Limpets.

The initial effects of the Santa Barbara oil spill on intertidal and kelp bed organisms were studied. Based on earlier surveys, the greatest negative biological change at a sample station after the spill was the loss of 16 plant species. However, losses in species were correlated in most cases with sand movement, and may have been related to the severe storms which occurred before and during the oil spill. Although gross species changes were not correlated with oil dosage, severe damage occurred in intertidal surf grass and barnacle populations as a result of the oil pollution. Potential long-term biological effects of the continuing pollution are discussed. (See also W72-09682) (LeGore-Washington)
W72-09683

A METHOD FOR THE ANALYSIS OF FISH, ANIMAL, AND PULTRY TISSUE FOR CHLORINATED PESTICIDE RESIDUES,
Food and Drug Administration, Washington, D.C. Div. of Pesticide Chemistry and Toxicology.
For primary bibliographic entry see Field 05A.
W72-09684

NOTES ON THE BIOLOGY OF PYGOSPIO ELEGANS FROM MAINE,
Maine Univ., Orono. Dept. of Zoology.
D. G. Trainer.
M. Sc Thesis August 1969. 69 p, 23 fig, 8 tab, 21 ref. OWRR A-011-ME (3).

Descriptors: *Reproduction, *Aquatic populations, Marine biology, Intertidal areas, *Maine, Aquatic animals, Water pollution effects.
Identifiers: *Pygospio elegans, *Regeneration, Polychaetes, Asexual reproduction.

Various aspects of the biology of P. elegans were investigated to compare the findings to those of European studies, and to investigate further the phenomenon of asexual reproduction in this species under natural and artificial conditions. A description of the spionid polychaete is included. Sexual reproduction, larval development, and regeneration are described and discussed. Experiments were conducted to study regeneration at different body levels, development of structures at different temperatures, and linear regenerative growth at different temperatures. No difference in the rates of regeneration at different body levels was indicated. Experiments did indicate that the rate of regeneration in P. elegans was dependent on temperature. (Svensson-Washington)
W72-09685

THE EFFECT OF TEMPERATURE ON THE FEEDING RATE AND BEHAVIOR OF THE CADDISFLY HYDROPSYCHE FRISONI,
DePauw Univ., Greencastle, Ind. Dept. of Zoology.
R. A. Gaseor.
M. A. Thesis. May 1971. 39 p, 8 fig, 3 tab, 20 ref. Project No. OWRR B-031-IND (3).

Descriptors: *Caddisflies, Aquatic insects, *Thermal stress, Insects, Lethal limit, Bioassay, *Heat resistance, *Water temperature, Water pollution effects, *Thermal pollution.
Identifiers: *Hydropsyche spp.

Caddisfly larvae (Hydropsyche frisoni) were subjected to thermal stress of 15-35 C, and observations of their feeding rates, death rates, and net spinning abilities were made. The feeding rate of larvae fed for 12 hr decreased as the temperature increased. Those fed for 24 hr consumed more at 30 C than at lower temperatures. An increase in impairment of net spinning ability and an increase in death rate seemed mutually related to temperature increase. When larvae were forced to spin nets, the death rate at 30 C was 67%, but when larvae were permitted to spin nets prior to thermal stress, only a 28% mortality occurred at 30 C. (LeGore-Washington)
W72-09686

RESEARCH ON ALGAL ODOR,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05F.
W72-09694

RESIDUES OF DDT IN LAKE TROUT AS A FUNCTION OF AGE,
Cornell Univ., Ithaca, N. Y. Dept. of Entomology.
W. D. Youngs, W. H. Gutenmann, and D. J. Lisk.

Descriptors: *Lake trout, *DDT, *DDD, *DDE, *Pesticide residues, *Chlorinated hydrocarbon pesticides, New York, Water pollution effects, Freshwater fish, Pesticide kinetics, Agricultural chemicals.
Identifiers: *Pesticide distribution, Game fish.

In lake trout of accurately known age, residues of p,p'-DDE, p,p'-DDD, and p,p'-DDT increased progressively with age from about 1ppm at 1 year to concentrations of about 14 ppm or higher at 12 years. The correlation between total residues (p,p'-dde, p,p'-DDD, and p,p-DDT) in fish and their age was highly significant. Total residues also correlated well with fish weight. Correlation between total residues and fat content was not significant. The relationship of sex to total residues in fish in given age groups could only be tested for trout 5-8 years old and sampled in 1969 where a sufficient number of both sexes were represented. Female trout had higher residues and this difference was highly significant. (Svensson-Washington)
W72-09714

A SURVEY OF THE LEAD CONTENT OF FISH FROM 49 NEW YORK STATE WATERS,
New York State Coll. of Agriculture, Ithaca.
For primary bibliographic entry see Field 05B.
W72-09715

ZINC RETENTION IN YOUNG RATS FED INCREASING LEVELS OF HIGH-ZINC OYSTERS,
Department of Natural Health and Welfare, Ottawa (Ontario). Food and Drug Research Lab.
B. G. Shah, J. C. Meranger, B. Belonje, and D. S. Deshmukh.
Journal of the Fisheries Research Board of Canada, Vol. 28, No. 6 p 843-848, 1971. 8 fig, 5 tab, 16 ref.

Descriptors: *Zinc, *Oysters, Public health, Water pollution effects, Commercial shellfish, Shellfish.
Identifiers: *Biological availability, *Zinc metabolism.

To determine the biological availability of zinc in oysters, 10 groups of 12 weaning rats each were fed diets containing 12, 60, 120, 240 and 2000 ppm added zinc either as zinc carbonate or as freeze dried oysters. Four rats from each group were killed at 2, 4, and 8 weeks from the begining of feeding, and their tissues analyzed. Neither the level of intake of zinc or its source has a significant effect on body weight, hemoglobin and hematocrit, and liver cytochrome oxidase activity. At the 60 ppm level, the apparant absorption of zinc from oysters was 16.3 plus or minus 3.7% (SE) and it was not significantly different from the corresponding value for ZnCO3 (18.5 plus or minus 2.2%) Zinc levels in soft tissues were not increased appreciably up to 260 ppm dietary zinc. At the 2000 ppm level, there was an initial increase that was not maintained for the duration of the experiment. Hair-zinc content did not vary with changing dietary intake but bone-zinc content increased with dietary level above 260 ppm and with duration of feeding at all levels tested. (Svensson-Washington)
W72-09716

INSIDIOUS ALTERATION OF THE ESTUARINE ENVIRONMENT,
Miami Univ., Fla. Inst. of Marine Sciences.
W. E. Odum.
Transactions of the American Fisheries Society, Vol. 99, No. 4, p 836-847, October 1970. 78 ref.

Descriptors: *Water pollution effects, *Estuaries, *Estuarine environment, Aquatic habitats, Estuarine fisheries, Intertidal areas, Saline water-fresh water interfaces, Food chains, Food webs, Primary productivity, *Dissolved oxygen, *Resistance, Salinity.
Identifiers: Estuarine ecosystmes, *Nutrient traps, Dissolved organics.

The vulnerability of shallow estuaries and their rich and productive ecosystems to subtle changes is discussed. The mechanisms which enable estuaries to be efficient nutrient traps also contribute to their ability to be pollutant traps. Because of their simplicity, food chains in shallow estuaries are particularly susceptible to interference from man. Many estuarine organisms are living near the limit of their tolerance range. These animals may be excluded from an estuary by any additional stresses, such as those caused by low levels of pollution or by decreased oxygen concentrations in the water resulting from dredging or mining operations. Undisturbed and stabilized sediments are improtant to an estuary for normal nutrient cycling, to prevent excess turbidity in the water column and as a site for extensive plant growth. Shallow estuaries naturally exist in a state of advanced eutrophication. For this reason they are vulnerable to any process which would lower the oxygen concentration of the water. The most productive and valuable zone in many estuaries is the intertidal and shallow subtidal areas. This boundary region is destroyed by construction of bulkheads. The low salinity region of an estuary is improtant both for protection of juvenile fish and invertebrates and for production of oysters. (Svensson-Washington)
W72-09717

MONITORING METALS IN MARINE ANIMALS,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 05A.
W72-09718

HEAVY METALS IN UNITED STATES FISH,
Food and Drug Administration, Washington, D.C.
For primary bibliographic entry see Field 05B.
W72-09719

EFFECTS OF POLYMER FORMULATIONS OF DURSBAN AND ABATE ON NON-TARGET ORGANISM POPULATIONS, APRIL - OCTOBER, 1970,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
D. R. Roberts, and T. A. Miller.
Available from the National Technical Information Service as AD-729 342, $3.00 in paper copy, $0.95 in microfiche. Entomological Special Study No. 31-004-71. 24 p, 8 fig, 3 tab, 5 ref, 2 spp.

Descriptors: *Larvicides, *Pesticide toxicity, *Chemcontrol, Pesticides, Insecticides, Mosquitoes, Polymers, Midges.
Identifiers: *Non-target organisms, *Abate, *Dursban, Gerris spp., Chironomus spp., Calopsectra spp., Chaoborus spp., Laccophilus spp., Culex spp., Polyethylene, Polyvinyl chloride.

Field tests were conducted to determine the effects on non-target organisms of Dursban (0,0-diethyl 0-(3,5,6-trichloro-2-pyridyl)phosphorothioate) and Abate (0,0-dimethyl phosphorothioate 0,0-diester with 4,4'-thiodiphenol), each formulated as a slow-release polymer and as a water emulsion. Three types of plastic lined artificial pools were used to determine effects in three simulated aquatic habitats. Nymphal and adult gerrids (Gerris spp.), adult midges (Chironomus spp. and Calopsectra spp.), larval chaoborids (Chaoborus punctipennis), and larval dytiscids (Laccophilus fasciatus) were the only organisms with sufficiently high average populations in the three types of pools to permit quantitative interpretation of the effects of the insecticide treatments. These studies did not determine whether a given population reduction was due to the toxic nature of the insecticide or, in the case of predators, to indirect effects on the food chain. However, it was evident that populations of three of the four non-target species were adversely affected in one way or another as a result of the insecticide treatment. (Svensson-Washington)
W72-09721

MANUAL ON THE BIOTECHNOLOGY OF THE PROPAGATION AND REARING OF PHYTOPHAGOUS FISHES.
Bureau of Commercial Fisheries, Washington, D.C. Office of Foreign Fisheries (Translations).
For primary bibliographic entry see Field 08I.
W72-09722

EFFECTS OF THERMAL POLLUTION ON PRODUCTIVITY AND STABILITY OF ESTUARINE COMMUNITIES,
Maryland Univ., College Park. Water Resources Research Center.
J. A. Mihursky, J. Gatz, D. R. Heinle, V. S. Kennedy, and A. J. McErlean.
Available from the National Technical Information Service as PB-210 127, $3.00 in paper copy, $0.95 in microfiche. Maryland Water Resources Research Center Completion Report, July 1971. 65 p, 21 fig, 2 tab, 41 ref. OWRR A-002-MD (10).

Descriptors: *Estuarine environment, *Heat resistance, *Thermal pollution, *Aquatic life, Fish, Copepods, Primary productivity, Invertebrates, Heated water, Estuaries, Chesapeake Bay, Thermal powerplants, Predation, *Water pollution effects.
Identifiers: Optimal temperature ranges.

Research results on thermal effects on estuarine life are presented. Effects of temperature and bacterial-saline interactions on primary producers were studied. Studies showed that predicting the effect on primary production of a specific variable is unreliable unless other interrelated variables are also evaluated. Algae passing through the cooling system of an electric power generating station are influenced by heat, chlorination, and possibly mechanical trauma. When the ambient water temperature is 17 C or cooler an 8 degree rise stimulates photosynthesis; the other factors appear to inhibit it. Studies of copepod populations in the vicinity of a power station showed a constancy despite changes in rates of predation and temperature. Laboratory studies indicated the more extreme changes which would cause a very rapid decline in or elimination of population. White perch thyroidal activity was found not to be involved in temperature tolerance. Studies of oyster eggs and larvae showed that survival in exposure to increased temperatures increased as length of exposure decreased. A temperature bioassay of sixteen macroinvertebrates and fish showed their wide range of temperature tolerances. Rationale and method of predicting optimal temperature ranges from the median lethal temperature are presented. (Eagle-Vanderbilt)
W72-09723

AQUATIC LIFE SURVEY OF THE WABASH RIVER--WITH SPECIAL REFERENCE TO THE EFFECTS OF THERMAL EFFLUENTS ON POPULATIONS OF MACROINVERTEBRATES AND FISH, 1967-1969,
DePauw Univ., Greencastle, Ind. Dept. of Zoology.
J. R. Gammon.
Completion Report, (1970). 65 p, 18 fig, 16 tab, 36 ref. OWRR B-031-IND (1).

Descriptors: *Aquatic life, *Thermal pollution, Heated water, Sport fish, Rivers, Fish populations, Aquatic populations, Electric powerplants, Resistance, *Water pollution effects, Catfishes, Bass, Pan fish, Carp, Invertebrates, Indiana.
Identifiers: Macroinvertebrates, *Wabash River (Ind).

Qualitative and quantitative difference in the fish and macroinvertebrate populations in segments of

the Wabash River which did and did not receive thermal additions were studied. Tables show the number and types counted and the flow and physical characteristics of the sections of river. Based on field observations of areas and quantities in which each type of fish occurred, a description of fish by temperature tolerance is presented. Flathead catfish were found below the power plant, but not elsewhere. Their sedentary behavior and the large crop of young fish showed that they prefer the warmer water. Numbers of bass and panfish decreased while catfish, carp, and shad increased in numbers in heated sections. With the macroinvertebrates, also, there was a shift in the abundance of the species, but little difference in population density. Simulium and Isonychia were relatively tolerant of high temperature while Baetis, Tricorythodes, and Hydropsyche were sensitive. In some species of fish, smaller or younger fish seemed to tolerate a higher temperature than the adults. There was no evidence of mortality among the fish; they moved away when the water was too hot and returned when the water cooled in the fall. (Eagle-Vanderbilt)
W72-09725

UPPER TEMPERATURE TOLERANCES OF SOME ESTUARINE BIVALVES,
Maryland Univ., Prince Frederick. Hallowing Point Field Station.
V. S. Kennedy, and J. A. Mihursky.
Chesapeake Science, Vol 12, No 4, p 193-204, December 1971. 3 fig, 2 tab, 54 ref. OWRR A-002 MD (12) and A-011 MD (3).

Descriptors: *Resistance, *Temperature, Heated Water, Benthos, Spawning, Size, Geographical regions, *Clams, Chesapeake Bay.
Identifiers: *Estuarine bivalves, Latitude, Species interaction, Acclimation.

Twenty-four hour, upper lethal temperatures were determined at different acclimation levels for Mya arenaria, Mocoma balthica, Mulinia lateralis and Gemma gemma. Limited information was obtained for Macoma phenax. Young Mya arenaria and Macoma balthica were more tolerant of high temperature than were older clams of the same species. This difference, and that between the two species, may be related to their vertical benthic distribution. Both species were less tolerant of high temperature than Gemma gemma and the more southerly ranging Macoma phenax. Mulinia lateralis was similar to Mya arenaria and Macoma balthica in its high temperature tolerance, although it ranges further to the south. If the less tolerant Mya were killed by high temperature, the more resistant Gemma could then occupy the vacated habitat, precluding resettlement of Mya due to larval Mya-adult Gemma competition for space. Excessive thermal discharge over Chesapeake Bay bentlos in summer could affect spawning patterns of Mya and Macoma balthica, eliminate Mya and influence Mya - Gemma competitive interactions. (Upadhyaya-Vanderbilt)
W72-09734

STUDIES ON A PISCICIDAL CONSTITUENT OF HURA CREPITANS: I. ISOLATION AND CHARACTERIZATION OF HURATOXIN AND ITS PISCICIDAL ACTIVITY,
Institute of Physical and Chemical Research, Saitama (Japan).
K. Sakato, K. Kawazu, and T. Mitsui.
Agric Biol Chem. Vol 35, No. 7: p 1084-1092. 1971. Illus.
Identifiers: *Hura crepitans D, Isolation, *Piscicidal activity, *Toxins, *Huratoxin.

Huratoxin, (alpha)D28 + 55.1 c=2.69, CHCL3, a piscicidal constituent, was isolated from the sap of H. crepitans. It was found to have the formula C34H48O8 and contain a 1,3-trideca-dienyl, an isopropenyl, a secondary methyl, an alpha-methylcyclopentenone, an epoxide and 3 hydroxyl (primary, secondary and tertiary) groups. Its piscicidal activity was evaluated to be about 10 times that of rotenone.--Copyright 1972, Biological Abstracts, Inc.
W72-09779

5D. Waste Treatment Processes

CAPITAL AND OPERATING COSTS--AWT,
Cham/Hill, Corvallis, Oreg.
D. R. Evans, and J. C. Wilson.
Journal of the Water Pollution Control Federation, Vol. 44, No. 1, p 1-13, January, 1972. 1 fig, 19 tab, 4 ref.

Descriptors: *Pollution abatement, *Waste water treatment, *Unit costs, *Tertiary treatment, *Capital costs, *Operating costs, Sewage treatment, Treatment facilities, California.
Identifiers: Lake Tahoe (Calif).

Increasing public interest in the quality of the environment has stimulated several questions concerning water pollution abatement. The most significant of these questions is what the cost of cleaning up the nation's lakes and rivers will be. In some instances, the addition of secondary treatment will be sufficient to reduce the pollution problem; however, in many instances, one or more of the various advanced waste treatment (AWT) processes will be required to eliminate the pollution problem. Analysis of the treatment processes at South Lake Tahoe, California, indicate that (1) the cost of conventional waste treatment at Tahoe is $172 per million gallons; and (2) the cost for AWT is an additional $212 per million gallons. The operating costs included in these estimates are based on a plant design capacity of 7.5 million gallons per day, while the capital costs include that of all equipment and construction but do not include design costs. The estimated cost of AWT at Tahoe represents the cost of the following seven separate unit processes: phosphorus removal; lime recovery; nitrogen removal; pH adjustment by recarbonation; mixed-media filtration; activated carbon adsorption and regeneration; and disinfection by chlorine. (Settle-Wisconsin)
W72-09140

ROLE OF THE SOIL CONSERVATION SERVICE IN DESIGN OF FEEDLOT WASTE MANAGEMENT FACILITIES,
Soil Conservation Service, Lincoln, Neb.
For primary bibliographic entry see Field 05G.
W72-09149

ALTERNATIVES FOR WASTE MANAGEMENT FOR OPEN BEEF FEEDLOTS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W72-09150

PHOTOGRAPHIC STUDIES OF THE DUNGING BEHAVIOR OF PIGS IN CONFINEMENT,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W72-09153

FACTORS AFFECTING NITRIFICATION KINETICS,
Briley, Wild and Associates, Daytona Beach, Fla.
Harry E. Wild, Jr., Clair N. Sawyer, and Thomas C. McMahon.
Journal of the Water Pollution Federation, 43 (9): 1845-1854. 1971. Illus.

Descriptors: *Kinetics, *Nitrification, Temperature, Hydrogen ion concentration, Pilot plants, Biochemical oxygen demand, Ammonia, Effluents, *Waste water treatment.

During the operation of a pilot plant for nitrification of a secondary effluent, laboratory studies were made to measure the effects of temperature, pH, mixed liquor volatile suspended solids (MLVSS), biochemical O2 demand (BOD), and ammonia levels on reaction kinetics. The rate of nitrification depends on temperature, increasing to the 30 deg. C maximum of this work. Optimum pH is 8.4. MLVSS, ammonia level, and BOD variations did not inhibit nitrification although a change in the average BOD concentration would affect the percentage of MLVSS which is composed of nitrifiers and, as a result, would affect the time necessary to effect complete nitrification.--Copyright 1972, Biological Abstracts, Inc.
W72-09174

COMPUTER SOFTWARE FOR WASTEWATER TREATMENT PLANT DESIGN,
Monsanto Enviro-Chem Systems Inc., Dayton, Ohio.
G. K. Chen, L. T. Fan, and L. E. Erickson.
Journal Water Pollution Control Federation, Vol 44, No 5, p 746-762, May 1972. 6 fig, 3 tab, 35 ref.

Descriptors: *Simulation, *Computer programs, *Systems analysis, *Mathematical models, *Waste water treatment, Dispersion, Diffusion, Sludge, Costs, Economic efficiency.
Identifiers: Raw waste flow, Overflow rate, Aeration chambers, Biological wastes.

A computer software program for the simulation of biological waste water treatment processes is developed to provide a basis for optimizing the most economical treatment plant design and operating conditions. The program consists of a data set for input-output handling, an executive subroutine, a parameter correlation subprogram, and a process simulator containing five unit computations. The program features use of the diffusion model for the aeration chamber and the adaption of cost functions that can be easily updated. Results indicate that the extent of fluid mixing or dispersion in the aeration vessel is an important parameter that affects the design of the activated sludge system. Furthermore, it may be desirable to adapt different operating conditions if the primary clarifier is added to the secondary treatment unit. Models employed in the simulation software can only be a first approximation to a real process. (Bell-Cornell)
W72-09233

MBF PILOT PLANT FILTRATION OF COMBINED MUNICIPAL AND PAPER MILL WASTE,
Johns-Manville Research and Engineering Center, Manville, N.J.
B. W. Long, and G. R. Bell.
New York State Department of Environmental Conservation, Albany, March 1971. 23 p, 4 fig, 3 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Pilot plants, *Tertiary treatment, *Municipal wastes, Water quality control, Waste water disposal, Filtration, Treatment, Comparative costs, Industrial wastes.
Identifiers: *Moving bed filter, Waterford.

Combined municipal and paper mill wastes were treated during August and September of 1970 at a pilot plant located in Waterford, New York. The objectives of the experimentation were: (1) to determine the effectiveness of the moving -bed filter (MBF), with respect to pH, turbidity, suspended solids (TSS), COD and total phosphorus and orthophosphate (TP and OP) when treating the mixed waste from the mill and town; and (2) to determine on a short-term basis whether the MBF-treated water would have economic or quality advantages when applied to activated carbon columns. General criteria for determining effectiveness were understood to be that the treated water be suitable for discharge to the Mohawk River or, ideally, be suitable for reuse as a paper mill supply. These pilot plant studies demonstrated that the MBF, using lime and a

strongly anionic polyelectrolyte, could achieve excellent clarification and more than 90 per cent total suspended solids (TSS) removal. On the average, 70.2 per cent of the COD was removed. With respect to total phosphorus (TP), removal averaged 78.5 per cent. The data clearly point to TP removal as pH dependent. At pH values in the 10.0 to 11.0 range, TP removals of the order of 90 per cent were attained. COD removal was increased from 70 to 87 percent and the carbon column effluent was colorless. When the colored matter contributed by the paper mill wastes consisted of pigment, MBF processing alone reduced color enough to permit water reuse in the paper mill. When the color was also due to small amounts of dye in solution, additional processing, as with activated carbon, was necessary for decolorization. (Poertner)
W72-09301

CHEMICAL-PHYSICAL WASTEWATER TREATMENT PHASE 2: ACTIVATED CARBON ADSORPTION AND POLISHING,
New York State Department of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
T. J. Tofflemire, L. J. Hetling, and W. W. Shuster.
January 1972. 44 p, 12 fig, 9 tab, 26 ref.

Descriptors: *Wastewater treatment, *Activated carbon, *Tertiary treatment, *Pulp and paper industry, *Pilot plants, Laboratory tests, New York, Chlorination, Water pollution treatment, Water pollution, Comparative costs, Water quality control, Biological treatment, Sewage treatment, Industrial wastes.
Identifiers: *Polishing, Hydrogen sulfide stripping.

An extensive research program was conducted on the treatment of a strong wastewater by primarily direct chemical-physical techniques. The significant results are discussed of those studies relating to carbon adsorption and polishing. Most of the experimental work was performed on a 50/50 wastewater (50% Waterford domestic sewage and 50% Mohawk Paper Mill wastewater) since this was the mixture projected for a proposed 2.25 MGD (5.9 cu m/min) waste treatment plant. The Mohawk Paper Mill manufactures primarily colored construction paper and does no pulping. Their waste includes fiber, inert fillers, starches and dyes. Waterford domestic sewage is a typical domestic sewage. In the experimental studies, lime coagulation, settling and neutralization generally preceded the activated carbon adsorption. The studies were performed on a strong wastewater, and many of the results would not apply to weak wastewaters. Studies were performed to obtain design data for a specific 2.25-MGD plant, and different economic limitations would have applied if a 10-to 100-MGD plant had been involved. Experimental work was conducted using three different carbon systems: (1) a laboratory system that employed five downflow columns containing Filtrasorb 300 carbon; (2) a 7000 gpd pilot plant; and (3) an upflow column system. All systems proved effective in removing color from the paper mill dyes, but the large pilot plant system gave the poorest COD removals. (Poertner)
W72-09302

METEOROLOGICAL EFFECTS OF COOLING TOWER PLUMES,
Air Resources Atmospheric Turbulence and Diffusion Lab., Oak Ridge, Tenn.
For primary bibliographic entry see Field 02B.
W72-09305

BASIN MANAGEMENT FOR WATER REUSE.
Alamo Area Council of Governments, San Antonio, Tex.

Copy available from GPO Sup Doc, $2.25; microfiche from NTIS as PB-209 932, $0.95. Environmental Protection Agency Water Pollution Control Research Series, February 1972. 285 p, 35 fig, 32 tab, 61 ref. EPA Program 16110 EAX 02/72.

Descriptors: *Municipal water, *Water reuse, *Waste water treatment, *Water treatment, Planning, Water allocation, Computer models, Ground water, Lime, Chemical precipitation, Cost analysis, Design criteria, Tertiary treatment, Water quality control.
Identifiers: San Antonio (Tex).

Quality requirements and results of water reuse were examined by using computer programs for the preliminary design and costing of wastewater renovation by the lime-clinoptilolite-carbon processes of advanced waste treatment; for activated sludge treatment; and for pipeline conveyance of water. San Antonio was used as a specific case, at the two extremes of discharge all and reuse none and discharge none and reuse all. A design water usage for the year 2000 of 341 mgd was predicted for both extremes. Costs for the conventional system of ground water plus surface water, treatment of surface water, and conventional sewage treatment and discharge were $264 million initial investment and 19.5 cents/1000 gallons for operational costs. By comparison, costs for a system involving ground water, no surface water, no water treatment, advanced waste treatment by the lime-clinoptilolite-carbon process directly on the raw sewage and recycling for reuse include a $164 million initial investment and production costs of 21.9 cents/1000 gallons. The difference between the 2 systems is slight enough that any real decision would have to await a more refined study, but the reuse system would seem to compare favorably to nearly any conventional system. (Lowry-Texas)
W72-09381

A MATHEMATICAL MODEL OF A FINAL CLARIFIER.
Rex Chainbelt Inc., Milwaukee, Wis.

Copy available from GPO Sup Doc, $1.00; microfiche from NTIS as PB-209 933, $0.95. Environmental Protection Agency Water Pollution Control Research Series, February 1972. 98 p, 24 fig, 14 tab, 67 ref. EPA Program 17090 FJW 02/72.

Descriptors: *Settling basins, *Sedimentation rates, *Activated sludge, Suspended solids, Mathematical models, Sampling, Monitoring, Aeration, Temperature, Data processing, Regression analysis, On-site investigations, Analytical techniques, Design criteria, *Waste water treatment.
Identifiers: *Final clarifiers, *Sludge quality, *Return sludge concentration.

Final clarifiers at three treatment plants were subjected to experimental testing to provide a set of data for the formulation and testing of a mathematical model for a final clarifier. Multiple regression analysis techniques were employed to develop equations for estimating the return sludge and effluent suspended solids concentrations. Those equations developed were: (1) maximum return sludge concentration (mg/l) = 106/540 x A4.397 x B0.213, where A = fraction of volatile suspended solids and B = BOD loading (lbs BOD/day/lb MLVSS); and (2) effluent suspended solids (mg/l) = 382 x (overflow rate)0.12 x B0.27/MLSS0.35 x (Detention time)1.03. Results of this investigation demonstrated that neither return sludge concentration nor effluent suspended solids concentrations could be estimated with any reasonable accuracy from those parameters normally available to the design engineer. Future investigations must include the development of some method for estimating the solids settling rate based on solids characteristics and activated sludge operational parameters before any further progress in mathematical modeling can be made. (Lowry-Texas)
W72-09382

WASTEWATER AMMONIA REMOVAL BY ION EXCHANGE.
Battelle-Northwest, Richland, Wash.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-209 934, $0.95. Environmental Protection Agency Water Pollution Control Research Series, February 1971. 113 p, 20 fig, 3 tab, 5 ref. EPA Program 17010 ECZ 02/71 and 17010 EEZ.

Descriptors: *Ammonia, *Ion exchange, *Zeolites, Resins, Separation techniques, Nitrogen, Lime, Pilot plants, Design criteria, Construction costs, Cost analysis, Hydrogen ion concentration, *Waste water treatment.
Identifiers: *Clinoptilolite, *Regeneration, South Lake Tahoe (Calif).

Pilot plant investigations of a nitrogen removal system employing a natural zeolite, clinoptilolite, which is selective for ammonium ions in the presence of sodium, magnesium, and calcium ions, were conducted at the South Tahoe Public Utility district. The system was operated on both clarified and carbon treated secondary effluent and clarified raw sewage. 94% removal was the average ammonia removal obtained using Tahoe tertiary effluent with single 6 ft. deep beds. With two column semi-countercurrent operation, 97% ammonia removal was achieved with 4.7 ft. deep beds, operating to an average of 250 bed volumes. For clarified raw sewage treated in the semi-countercurrent columns, 93% average ammonia removals were achieved at average throughputs of 282 bed volumes. Regeneration was accomplished by reacting the exhausted zeolite with hydroxyl ions to form an alkaline aqueous ammonia solution suitable for air stripping and discharge to the atmosphere. The regenerant solution is not discarded and no liquid wastes are generated. A 7 1/2 mgd plant was designed based on the pilot plant data. Estimates for operational costs and construction costs, based on current costs in the Lake Tahoe region and capital costs amortization at 6% over 20 years were $84.95/million gallons and $63.10/million gallons, respectively. (Lowry-Texas)
W72-09383

WASTEWATER DEMINERALIZATION BY ION EXCHANGE,
Culligan International Co., Northbrook, Ill.
E. Kreusch, and K. Schmidt.
Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-209 935, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1971. 129 p, 24 fig, 48 tab. EPA Program 17040 EEE 12/71.

Descriptors: *Ion exchange, *Demineralization, *Phosphate, Separation techniques, Lime, Chemical precipitation, *Filtration, Activated carbon, Adsorption, Turbidity, Alkalinity, Anion exchange, Cation exchange, Suspended solids, Cost analysis, *Pilot plants, *Waste water treatment.

The feasibility of wastewater demineralization by ion exchange procedures was successfully demonstrated by pilot plant studies conducted on sewage effluent from an activated sludge treatment plant. A pretreatment unit consisting of lime clarification, dual media filtration, and granular activated carbon filtration was operated in series with the ion exchange system. Phosphate reductions from 18.6 mg/l to less than 2.0 mg/l were achieved by lime clarification at pH 10.0, but identical reductions were achieved by ion exchange alone. In addition ion exchange treatment with lime clarification averages 18.0 cents/1000 gallons of sewage, whereas treatment without lime clarification was only 15.3 cents/1000 gallons. Ion exchange processes using strong acid cation exchange resin and weak base anion exchange resin can be readily applied to wastewater demineralization without difficulty. Design of treatment plants for such a process applied to wastewater containing as much

as 500 mg/l of ionizable solids can use established design parameters. Waste regenerants from the ion exchange system must be reused, or neutralized and disposed of by locally acceptable methods. Disposal of sludges and saline liquids must also be considered. (Lowry-Texas)
W72-09384

MEMBRANE PROCESSING OF COTTAGE CHEESE WHEY FOR POLLUTION ABATEMENT.
Crowley's Milk Co., Binghamton, N.Y.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-209 936, $0.95. Environmental Protection Agency Water Pollution Control Research Series, July 1971. 123 p, 54 fig, 17 tab, 5 ref. EPA Program 12060 DXF 07/71.

Descriptors: *Dairy industry, *Industrial wastes, *Byproducts, Proteins, Membrane processes, Separation techniques, Reverse osmosis, Laboratory tests, Pilot plants, Operation and maintenance, Cost analysis, *Waste water treatment.
Identifiers: *Ultrafiltration, *Whey, *Lactose, Flux.

An ultrafiltration reverse osmosis system for the treatment of cottage cheese whey has been successfully demonstrated on both the laboratory and pilot plant scale. A protein concentrate is recovered in the ultrafiltration step and the remaining deproteinized whey is concentrated by reverse osmosis to provide a lactose concentrate. Both concentrates can either be processed further or used directly as liquids. 97% BOD reductions, from 35,000 mg/l to less than 1000 mg/l were achieved. Membrane life was excellent and membrane fluxes were economically high. Total plate counts in the pilot plant produced concentrates were typically below 50,000 org/ml; while coliform counts were nil. Total capital cost for a 300,000 lbs cottage cheese whey/day demonstration plant was estimated at $697,000, with total annual operating costs estimated at $220,000. However, 576,000 lbs of protein and 4,320,000 lbs of lactose will be recovered, and sale of these products is expected to meet capital and operating expenses as well as show a highly favorable return on the investment. (Lowry-Texas)
W72-09385

WASTE TREATMENT LAGOONS-STATE OF THE ART.
Missouri Basin Engineering Health Council, Cheyenne, Wyo.

Copy available from GPO Sup Doc, $1.25; microfiche from NTIS as PB-209 937, $0.95. Environmental Protection Agency Water Pollution Control Research Series, July 1971. 152 p, 9 tab, 42 ref. EPA Program 17090 EHX 07/71.

Descriptors: *Sewage lagoons, *Aerated lagoons, *Oxidation lagoons, *Design criteria, Biodegradation, Algae, Photosynthesis, Suspended solids, Separation techniques, Filtration, Municipal wastes, Industrial wastes, Operation and maintenance, *Waste water treatment, Water quality control, *Reviews.
Identifiers: *Facultative lagoons, *Anaerobic lagoons.

A review of published literature and field evaluations revealed the presence of over 3500 waste treatment lagoons currently in operation in the United States. The three types of lagoons in use include: (1) oxidation lagoons; (2) aerated lagoons, and (3) anaerobic lagoons. Oxidation lagoons depend upon algae to supply oxygen by photosynthesis and degrade the waste products. Effluent quality is determined by the quantity of algae in the effluent and several methods of algae removal are currently under investigation. Aerated lagoons may be merely oxidation ponds with supplemental aeration, partially mixed activated sludge (facultative aerated) or complete mix activated sludge (C-MAS) systems. High quality effluents from aerated lagoons can be achieved only be removing effluent microbial solids. Anaerobic lagoons can provide up to 80% BOD removals, but must be followed by some type of aerobic treatment to produce a high quality effluent. This review has demonstrated that lagoons do have applicability to the total waste treatment problem, but the future of lagoons depends upon proper design and operation in relationship with the fundamental biochemistry of the microbes in the various systems. (Lowry-Texas)
W72-09386

PHOSPHATE PRECIPITATION WITH FERROUS IRON,
North American Rockwell Corp., Canoga Park, Calif. Atomics International Div.
M. Ghassemi, and H. L. Recht.
Copy available from GPO Sup Doc, $0.70; microfiche from NTIS as PB-209 939, $0.95. Environmental Protection Agency Water Pollution Control Research Series, September 1971. 64 p, 6 fig, 17 tab, 18 ref. EPA Program 17010 EKI 09/71.

Descriptors: *Phosphate, *Chemical precipitation, *Separation techniques, Iron compounds, Hydrogen ion concentration, Dissolved oxygen, Oxidation, Aeration, Sedimentation, Laboratory tests, *Waste water treatment.
Identifiers: *Waste pickle liquor.

Pure solutions of orthophosphate at concentrations representative of those in wastewater, orthophosphate solutions containing bicarbonate alkalinity, pyro and tripolyphosphate solutions, and secondary effluent samples from an activated sludge plant were used in batch precipitation tests of phosphate removal by ferrous iron additions. The effects of pH, reactant concentration, and diverse ions on the rate and efficiency of reactant removal were evaluated. For orthophosphate precipitation with Fe (II), a reaction time of 5 hrs., an initial orthophosphate concentration of 12 mg/l, and an Fe (II) to orthophosphate equivalence ratio of 1.0, a maximum orthophosphate removal of 97% was attained at pH 8.0. Reaction time for maximum orthophosphate removal increased with decreasing pH. Reaction speed was independent of Fe (II) concentration but decreased at lower orthophosphate levels. System behavior was the same in secondary effluent as in pure solution. Dissolved oxygen addition increased orthophosphate removal efficiency, but the resulting precipitate was very fine and hard to settle. Comparisons of Fe (II) data with that of Fe (III)- and Al (III)-phosphate systems are included. (Lowry-Texas)
W72-09388

ACTIVATED SLUDGE PROCESSING.
Union Carbide Corp., Tonawanda, N.Y. Linde Div.

Copy available from GPO Sup Doc, $0.50; microfiche from NTIS as PB-209 940, $0.95. Environmental Protection Agency Water Pollution Control Research Series, February 1972. 164 p, 24 fig, 7 tab, 18 ref. EPA Program 17050 DNW 02/72.

Descriptors: *Activated sludge, *Oxygenation, Oxygen, *Aeration, *Sludge digestion, *Filtration, On-site investigations, Vacuum drying, Suspended solids, Cost analysis, *Waste water treatment, *New York.
Identifiers: *Sludge production, *Mass balances, *Batavia (NY).

A two phase, full scale investigation of the effects of high purity oxygen aeration in the activated sludge process was conducted at the Batavia, New York Municipal Pollution Control plant. During the first phase of the 4 month study, the entire wastewater flow was treated in one of 4 available aeration bays using pure oxygen aeration. The second phase involved pure oxygen aeration of half the flow in one bay and conventional aeration of the remaining flow in another bay. Solids and mass balances were performed for each week of operation to evaluate in depth the solids production and solids profile through the oxygenation system. The mass balances indicated that a valid accounting of solids was obtained during the study, and the data demonstrated that oxygenation with pure oxygen produced 40-45% fewer biological solids than the conventional air aeration. Filtering characteristics of waste activated sludge from the oxygenation system were excellent, with filter yields as high as 4,5 lbs/hr/ft2 of filter area obtained with unthickened sludge. Waste activated sludge was also aerobically digested in 800 gallon batches using pure oxygen and a 20 to 30% volatile suspended solids reduction was achieved in 7 to 9 days, with an essentially odorless stabilized sludge produced. Costs for both systems for 1 mgd flows were comparable, but savings of as much as 20% were projected for 100 mgd plants using oxygenation. (Lowry-Texas)
W72-09389

LIQUID WASTES FROM CANNING AND FREEZING FRUITS AND VEGETABLES.
National Canners Association, Berkeley, Calif. Western Research Lab.

Copy available from GPO Sup Doc, $1.50; microfiche from NTIS as PB-209 941, $0.95. Environmental Protection Agency Water Pollution Control Research Series, August 1971. 158 p, 4 fig, 27 tab, 702 ref. EPA Program 12060 EDK 08/71.

Descriptors: *Food processing industry, *Industrial wastes, *Canneries, Fruit crops, Vegetable crops, *Waste water treatment, Irrigation, Biodegradation, Operation and maintenance, Research and development, Biochemical oxygen demand, Suspended solids, Hydrogen ion concentration, Cost analysis, Peaches, Sweet corn, Tomatoes.
Identifiers: *Peas, *Beets.

It has been estimated that the approximately 1800 plants in the canned and frozen fruits and vegetables industry in the U.S. annually utilize 26 million tons of raw product, discharge 83 billion gallons of wastewater, generate 800 million pounds of BOD and 392 million pounds of suspended solids, and produce 8 million tons of solid residuals. Flow diagrams are presented for peaches, peas, corn, beets, and tomato products, and proportions of the total liquid waste flow, BOD, and SS from each of 5 or 6 processing steps for 15 commodities are estimated. Several conventional waste treatment methods are presented, along with their potential application to the food processing industry. Liquid waste treatment and/or discharge costs for a synthetic average plant in the industry are estimated at $18,000/year or $1.30 per ton of raw product, including annual capital and operation and maintenance costs. (Lowry-Texas)
W72-09390

THE EFFECTS OF COBALT-60 RADIATION ON TEXTILE PROCESSING WASTE,
Auburn Univ., Ala.
C. T. King, III.
M.Sc. Thesis, December 9, 1970. 149 p, 30 fig, 64 tab, 34 ref. OWRR A-012-ALA (2).

Descriptors: *Textiles, *Industrial wastes, *Irradiation, Biochemical oxygen demand, Chemical oxygen demand, Color, Hydrogen ion concentration, Cobalt, Gamma rays, Oxygen, Nitrogen, *Waste water treatment.
Identifiers: *Radiation dose rate, *Gas sparging.

Both textile desize waste and textile plant effluent were subjected to various treatments involving gamma radiation produced by Cobalt-60 in laboratory scale investigations. Process variables included irradiation dose rate, the presence of oxygen or nitrogen gas in the sample during irradiation, initial concentrations of BOD and COD in the wastes, and the time of sample exposure to irradia-

tion. The effects of changing one or more of the variables on BOD, COD, color, and pH for both wastes were then recorded. Maximum BOD reduction for textile desize waste (41.6%) occurred at an 83.4 ppm BOD concentration, an irradiation rate of 15,000 rads/min, and with no gas sparging. Maximum BOD reduction of plant effluent (71.35%) occurred at an initial BOD of 95.3 ppm, a dosage rate of 15,000 rads/min, and with oxygen sparging. Time of exposure had no effect on reducing the BOD, COD, or color of desize waste, but was an important factor for plant effluent. All reductions seemed to be dependent more upon interactions between variables rather than each variable separately. (Lowry-Texas)
W72-09391

CRYSTAL SEED CONDITIONING OF CALCIUM CARBONATE SLUDGE,
Auburn Univ., Ala.
For primary bibliographic entry see Field 05F.
W72-09392

FILTRATION OF WATER AND WASTEWATER,
University Coll., London (England).
K. J. Ives.
CRC Critical Reviews in Environmental Control, Vol 2, No. 2, August 1971. p 293-335, 8 fig, 9 tab, 99 ref.

Descriptors: *Filtration, *Operation and maintenance, *Cost analysis, *Filters, Headloss, Pressure, Turbidity, Algae, Flocculation, Cleaning, *Water treatment, Tertiary treatment, *Waste water treatment.
Identifiers: *Microstraining, *Precoat filtration, Backwashing, Specific resistance.

A review of the recent advancements in filtration technology was conducted, dealing primarily with slow sand filters, rapid sand filters, precoat filters, and microstrainers. Applications, modes of operation, maintenance required, and cost figures were assembled for each type of filter. Some general rules for filtration which were selected from the technical literature include: (1) heavy turbidity loads cannot be sustained by either slow sand or precoat filters; (2) alum floc will clog slow sand filters whereas microstrainers will not retain it; (3) slow sand and precoat filters retain fine turbidity, rapid sand filters retain it if it is previously flocculated, and microstrainers cannot retain it; (4) all 4 filters retain plankton, although smaller algae are not retained by microstrainers and rapid filters; (5) only microstrainers and radial flow rapid filters operate continuously; (6) microstrainer headloss is 0.15 m compared to 1 to 20 m for the other filter types; and (7) rapid filters have the widest applicability to both water and wastewater treatment. Costs presented were not for optimum filters, since treatment systems, not treatment components, are optimized. (Lowry-Texas)
W72-09393

THE EFFECTS OF OIL ON SEWERS AND TREATMENT PLANTS,
Balfour (D.) and Sons, London (England).
J. R. Simpson.
Water Pollution Control, Vol 69, No. 5, 1970. p 593-595, 1 ref.

Descriptors: *Sewerage, *Waste water treatment, *Oil, *Scum, Design criteria, Pumping, Pipes, Activated sludge, Sludge, Metabolism, Analytical techniques, *Treatment facilities.
Identifiers: *Ether extractable material, *Grease.

Problems which can be caused by the presence of ether extractable materials (EEM) must be recognized and compensated for in the design of sewage collection and treatment facilities. EEM is produced at the average rate of 0.04 lb/capita/day by the population of the United Kingdom. However, there is no typical condition governing EEM discharge into sewage systems since the amount of industrial oil introduced is variable. Design of treatment plants for prevention of EEM problems must involve careful consideration of: (1) pipe diameter and pump size; (2) the layout of pumps and pipe to facilitate cleaning and flushing; (3) the use of construction materials which can readily be cleaned when fouled; (4) chemical layout and accessability of the mechanical plant to facilitate cleaning; (5) provision of adequate skimming and scum removal devices; and (6) the type and layout of pump control systems to prevent fouling and facilitate cleaning. A need for the development of inexpensive, simple, reliable tests for differentiating free, immiscible, and emulsified EEM is also indicated as an aid in monitoring plant performance and indicating which designs would be most effective. (Lowry-Texas)
W72-09395

DEVELOPMENT AND USE OF A LARGE--VOLUME AUTOMATIC RESPIROMETER,
Newcastle-upon-Tyne Univ. (England).
J. R. Simpson, and G. R. Nellist.
Water Pollution Control, Vol 69, No. 5, 1970. p 596-605, 6 fig, 2 tab, 6 ref.

Descriptors: *Analytical techniques, *Biochemical oxygen demand, *Respiration, Sampling, Automatic control, Pressure, Temperature, Oxygen, Absorption, Carbon dioxide, Metabolism, Toxicity, Time lag, Design criteria, Water analysis, *Waste water treatment.
Identifiers: *Oxygen utilization, *Buffers.

An automatic recording respirometer was assembled from parts readily available in most laboratories for measuring the oxygen utilization of various wastes. A photoelectric cell unit was employed to control the oxygen supply and carbon dioxide was removed by absorption in a sodium hydroxide solution. The entire apparatus was kept at constant temperature by a water bath. Oxygen was inttroduced in small increments and CO2 was removed as instantaneously as possible in order to keep the pressure and composition of the atmosphere above the respiration flask as nearly constant as possible. Correlation between oxygen utilization (OU) measurements and BOD measurements was excellent, with the OU results being at least as reproducible as BOD measurements. The major importance of the respirometric method is its ability to supply information on the oxygen requirement, retention time, and reaction rate of wastes for which facilities are being designed in a matter of hours instead of weeks. (Lowry-Texas)
W72-09396

COST OF WASTE TREATMENT IN THE MEAT PACKING INDUSTRY,
Wichita State Univ., Kans. Dept. of Economics.
K. Q. Camin.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970. Purdue University Engineering Extension Series No. 137, p 193-202, 8 tab, 3 ref.

Descriptors: *Food processing industry, *Industrial wastes, *Waste disposal, Water consumption, Cost analysis, Flotation, Sewage lagoons, Trickling filters, Activated sludge, Aeration, Cities, *Waste water treatment.
Identifiers: *Meat packing industry, *Waste generation factor, Catch basins.

The four basic alternatives open to the meat packing industry for waste disposal are: (1) industrial waste treatment in facilities owned and operated by the industry; (2) industrial waste treatment followed by treatment in a municipal waste treatment plant; (3) treatment in a municipal waste treatment plant only; and (4) no treatment. Nearly 80% of all Federally inspected slaughter houses used the industrial followed by municipal treatment. Wastes generation by the meat packing industry is dependent upon volume of live weight killed (LWK). For small plants, 869 gallons of liquid wastes result from slaughtering 1000 lbs of live weight. For medium and large plants, wastes generation is 1231 and 1410 gallons/1000 lbs LWK, respectively. The various treatment methods of 'catch basins', air flotations, lagoon systems, trickling filters, activated sludge, anaerobic contact and channel aeration are analyzed individually as to gross waste load treated, gross waste load removed, and waste load removed per dollar invested. An analysis of total payments by the meat packing industry to municipalities in 1966 is also presented, showing an $8.003 million total for the year. (Lowry-Texas)
W72-09397

THE EFFECT OF CHLOROFORM IN SEWAGE ON THE PRODUCTION OF GAS FROM LABORATORY DIGESTERS,
Middle Lee Regional Drainage Scheme (England).
D. P. Stickley.
Water Pollution Control, Vol 69, No. 5, 1970. p 585-592, 14 fig, 8 tab, 14 ref.

Descriptors: *Domestic wastes, *Industrial wastes, *Solvents, *Volatility, Cleaning, Safety, Public health, Anaerobic digestion, Toxicity, Inhibition, Laboratory tests, Analytical techniques, *Waste water treatment.
Identifiers: *Chloroform.

The toxicity of chloroform contaminated sludge to the anaerobic digestion process was investigated using 3-liter capacity continuous digesters receiving: (1) single shock doses of raw sludge containing known levels of chloroform to determine the effects of the doses of chloroform on the gas yield; and (2) continuous doses of raw sludge with known chloroform levels to determine the effect of various concentrations of chloroform on the gas yield. Results demonstrated that shock doses of chloroform as low as 1 mg/l caused a drop in gas yield from the experimental digesters. It was further demonstrated that continuous doses of chloroform at 16 mg/l or more in the raw sludge resulted in complete inhibition of digestion while continuous doses of 10 and 11 mg/l produced a noticeable decrease in gas production over a period of time. (Lowry-Texas)
W72-09398

THE USE OF SEWAGE EFFLUENT AT SOUTH AFRICAN PULP AND PAPER INDUSTRIES' ENSTRA BLEACHED KRAFT MILL,
South African Pulp and Paper Industries, Ltd., Enstra Mill.
P. J. Conradie, and E. J. Smith.
Water Pollution Control, Vol 69, No 5, 1970, p 496-500. 4 tab, 6 ref.

Descriptors: *Pulp and paper industry, *Water reuse, *Municipal wastes, Hardness (Water), Color, Alkalinity, Hydrogen ion concentration, Lime, Coagulation, Flotation, Sedimentation, Filtration, Chlorination, Turbidity, *Waste water treatment.
Identifiers: *Carbonation, *Dolomitic water.

The Enstra Mill of the South African Pulp and Paper Industries, Ltd. (SAPPI) was put into operation in 1939. The mill, located some 60 miles from the nearest waterway, drew its water supply both from a nearby town (1.5 mgd maximum), and from the adjacent East Geduld Mines. By further arrangement, effluents from the Enstra Mill were used to slurry the slimes from the mines and carry them to their respective slime dams. After the mill was put in operation, additional water supplies were obtained by using treated sewage effluent from the McComb works of the Springs Municipality. The Mill presently utilizes about 8.5 mgd of water, but the sewage effluent used now is to be subjected to lime sedimentation or flotation, solids contact stabilization (consisting of carbonation with CO2 and settling), recarbonation to desired pH, and sand filtration. Pilot scale tests of this treatment system have been successfully conducted and plans are now being prepared for a full scale installation. (Lowry-Texas)
W72-09399

DESIGN OF THE BEDDINGTON WORKS OF THE LONDON BOROUGH OF CROYDON,
London Borough of Croydon (England).
D. A. H. Everett, and M. G. Healey.
Water Pollution Control, Vol 69, No 5, 1970, p 540-551. 8 fig, 8 ref.

Descriptors: *Municipal wastes, *Waste water treatment, *Design criteria, Screens, Sedimentation, Activated sludge, Nitrification, Anaerobic digestion, Sludge disposal, Automatic control, Administration, Personnel, Electric power production, Cost analysis, *Treatment facilities.

A new treatment works for the London Borough of Croydon has been designed for a dry weather flow of 18, 15 mgd and a maximum flow of 200 mgd. The area served is predominantly residential, with industrial effluents comprising only a small portion of the total flow. Average analytical figures used for design were 260 mg/l SS and 400 mg/l BOD. Bar screens and a horizontal detritor provide initial screening and grit removal capacity. Primary treatment is accomplished in 8 circular sedimentation tanks designed for a 2 hour detention time at maximum flow. Activated sludge with diffused air aeration was chosen to provide biodegradation of organics present, and nitrifying filters were added to satisfy effluent nitrogen limits. Half of all flows up to 2.0 mgd will receive rapid gravity sand filtration. Finally, treatment of both primary and secondary sludge will be accomplished in 6 heated sludge digestion tanks. Total project costs of 3.95 million pounds have been presented as an initial estimate. (Lowry-Texas)
W72-09400

OPERATION OF BYBROOK SEWAGE WORKS, ASHFORD, KENT, 1965-68,
Bybrook Sewage Works, Ashford (England).
T. M. Staynes.
Water Pollution Control, Vol 69, No 5, 1970, p 558-562. 4 fig, 7 tab, 1 ref.

Descriptors: *Municipal wastes, *Waste water treatment, *Performance, Administration, Biochemical oxygen demand, Sampling, Suspended solids, Anaerobic digestion, Irrigation, Heavy metals, Detergents, Toxicity, Weeds, Harvesting, Costs, *Treatment facilities.

The Bybrook Works of Ashford (Kent) UDC was designed to treat 2.14 mgd, including 0.525 mgd of trade effluent, from a population of 36,000. The treatment scheme includes comminutors, a detritor, sedimentation tanks, biological filters, humus tanks, and irrigation areas, with heated primary digestion tanks, secondary digestion tanks, and sludge drying beds. The major difficulties encountered have been mainly the result of the inability of the humus tanks to produce a consistently good effluent. This inability has made it impossible to rest the irrigation areas during the winter with disastrous results. Difficulties have also been encountered with the digestion plant, apparently caused by a combination of synthetic detergent and heavy metals at threshold concentrations. Remedial actions taken to alleviate the obvious difficulties are presented, along with annual operational costs. (Lowry-Texas)
W72-09401

TREATMENT OF SEWAGE DIGESTER SUPERNATANT LIQUOR,
Environmental Protection Agency, Washington, D.C. (Assignee).
M. G. Dunseth, and J. J. Brinkman.
U. S. Patent No. 3,634,231, 3 p, 3 tab, 1 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 2, p 720, January 11, 1972.

Descriptors: *Patents, *Sewage treatment, Pollution abatement, Water pollution, Water pollution treatment, Separation techniques, *Phosphorus, *Sewage sludge, Nitrogen, Chemical oxygen demand, Biochemical oxygen demand.
Identifiers: *Digester supernatant liquor.

A process is disclosed for removal of 80 per cent or more of the total phosphorus of digester supernatant liquor. The DSL is heated for at least 5 min. at temperatures ranging from 40 to 80 degrees C at or below ambient pressure. Treatment time, temperature and pressure are adjusted to provide a pH of the liquor of 8.5 to 8.9. The process also results in substantial reduction of nitrogen, COD and BOD. Results of seventeen experimental studies are described and findings are tabulated. (Sinha-OEIS)
W72-09488

METHOD AND APPARATUS FOR WITHDRAWING HEAT FROM INDUSTRIAL PLANTS, ESPECIALLY POWER PLANTS,
Maschinenbau A. G. Balcke, Bochum (West Germany).
K. Spangemacher.
U. S. Patent No. 3,635,042, 4 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 3, p 903, January 18, 1972.

Descriptors: *Patents, *Power plants, *Cooling towers, *Heated water, Industrial plants, Pollution abatement, Water pollution, Air pollution, Water pollution treatment, *Thermal pollution, *Water loss, Facilities, *Condensation, Electric power.

The withdrawal of waste heat from industrial plants particularly power plants is accomplished by an arrangement in which a dry cooling tower and a wet cooling tower are combined with each other and water loss is minimized. There is parallel feeding of the cooling air to the dry cooling tower and to the wet cooling tower while conveying heat derived from the waste heat to the cooling air and withdrawing the heated air from both towers. (Sinha-OEIS)
W72-09489

WASTE WATER TREATMENT PROCESS,
Envirotech Corp., Palo Alto, Calif. (Assignee).
M. M. Zuckerman, and A. H. Molof.
U. S. Patent No. 3,635,817, 4 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 3, p 1093, January 18, 1972.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, Water pollution, Water pollution treatment, Waste water, *Hydrolysis, Water treatment, *Organic matter, *Industrial wastes, *Municipal wastes, Separation techniques, Water reuse, *Activated carbon, *Adsorption.

Waste water is treated in a hydrolysis treatment sequence wherein large soluble organic molecules are broken down into small molecules such as amino acids and mono and disaccharides. These are adsorbed by activated carbon or other absorbents. The hydrolysis is preferably accompanied by the removal of suspended solids and the process may include additional steps such as sand filtration or ammonia stripping at various stages. (Sinha-OEIS)
W72-09492

SYSTEM FOR MEASURING ORGANIC CONTENT OF WATER,
Envirotech Corp., Palo Alto, Calif. (Assignee).
M. M. Zuckerman, and A. H. Molof.
U. S. Patent No. 3,635,564, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 3, p 1037-1038, January 18, 1972.

Descriptors: *Patents, *Organic matter, *Conductivity, *Monitoring, Treatment facilities, Water treatment, Water properties, *Organic wastes, Biochemical oxygen demand, *Dissolved solids, *Turbidity, *Measurement.

A system for monitoring the performance of a water treatment facility is provided. The soluble organic content of water is measured by a refractometer which compares the refractive index of a water sample with a known sample. Electrical conductivity measurements and turbidity measurements are compared with known samples. (Sinha-OEIS)
W72-09493

FLOTATION OF SOLIDS FROM WASTE WATERS,
Hercules Inc., Wilmington, Del. (Assignee).
W. H. Gardner, and N. F. Stanley.
U. S. Patent No. 3,637,490, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 4, p 1478-1479, January 25, 1972.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Municipal wastes, *Flocculation, Polymers, Water pollution, Water pollution treatment, Pollution abatement, Separation techniques, Bubbles.

A solid flotation agent and a flocculant are added to waste water to cause coflocculation with the waste solids so that the flocs rapidly seaparate. Microballoon agents and flocculant polymers are used. (Sinha-OEIS)
W72-09496

REMOVAL OF INORGANIC SPECIES BY LIQUID MEMBRANE,
Esso Research and Engineering Co., Linden, N.J. (Assignee).
N. N. Li, R. P. Cahn, and A. L. Shrier.
U. S. Patent No. 3,637,488, 5 p, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 4, p 1478, January 25, 1972.

Descriptors: *Patents, *Waste water treatment, *Membranes, *Emulsions, Phosphates, Separation techniques, *Liquid wastes, Inorganic wastes.

A liquid membrane may be used to separate inorganic compounds, such as phosphates, from waste water. The liquid membrane coats emulsion-size aqueous phase droplets which contain an ion capable of reacting with the inorganic contaminants to form a precipitate which remains within the droplet. (Sinha-OEIS)
W72-09497

PROCESS FOR REMOVAL OF INORGANIC AND ORGANIC MATTER FROM WASTE WATER SYSTEMS,
Reichhold Chemicals, Inc., White Plains, N.Y. (Assignee).
J. J. Odom, Jr., T. P. Shumaker, and D. B. Griffin.
U. S. Patent No. 3,634,230, 5 p, 8 ref; Official Gazette of the United States Patent Office, Vol 894, No 2, p 720, January 11, 1972.

Descriptors: *Patents, *Waste water treatment, *Organic wastes, Organic matter, Inorganic compounds, Resins, Phosphates, Chromium, Pigments, *Detergents, Alkylbenzene sulfonates, Nitrogen compounds, *Phenols, Dyes, Pollution abatement, Separation techniques, Water pollution, Water pollution treatment.
Identifiers: *Uranium salts.

Waste water systems are treated with a phenolic aldehyde resin solubilized by alkali to effect removal of uranium salts and other inorganic salts such as phosphates, chromates, inorganic pigments, partially or wholly non-biodegradable detergents and organic matter such as decayed plants, other nitrogenous substances, phenol and phenol derivatives and color-bearing matter. Seven examples of successful tests are reported. (Sinha-OEIS)
W72-09500

BIOCHEMICAL PROCESS,
Bacti Products, Inc. (Assignee).
B. E. Witt, and H. A. Bennett.
U. S. Patent No. 3,634,226, 3 p, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 894, No 2, p 719, January 11, 1972.

Descriptors: *Patents, *Industrial wastes, Sewage, *Biodegradation, Biochemistry, Wastes, *Domestic wastes, *Lipids, *Sewage treatment, *Bacteria, Odor, *Waste water treatment.
Identifiers: *Deodorization.

Biodegradation and deodorization are accomplished by inoculating the waste with a culture of viable mutant organisms ATCC 21160. The inoculum comprises about 0.5 billion bacteria per gallon of waste. Examples of five tests are reported. (Sinha-OEIS)
W72-09502

FLOCCULATION OF PARTICLES DISPERSED IN AQUEOUS MEDIA AND FLOCCULANTS USED THEREIN,
Standard Brands Chemical Industries, Inc., Dover, Del. (Assignee).
E. Witt.
U. S. Patent No. 3,632,507, 10 p, 11 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 894, No 1, p 305, January 4, 1972.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, Separation techniques, Water pollution, Water pollution treatment, *Flocculation, *Polymers, *Sewage, *Pulp wastes, *Polyelectrolytes.
Identifiers: Paper mill effluent.

This process comprises mixing a liquid dispersion with a cationic N-containing polyelectrolyte in amounts to cause flocculation of the particles. The polymeric polyelectrolyte consists of a water soluble, polyquaternary ammonium salt containing quarternary nitrogen atoms within a polymeric backbone. (Sinha-OEIS)
W72-09505

EXPERIMENTAL EVALUATION OF FIBROUS BED COALESCERS FOR SEPARATING OIL-WATER EMULSIONS.
Illinois Inst. of Tech., Chicago. Dept. of Chemical Engineering.

Copy available from GPO Sup Doc, $1.75; microfiche from NTIS as PB-210 144, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, November 1971. 97 p, 47 fig, 22 tab, 18 ref. EPA Program 12050 DRC 11/71.

Descriptors: *Oil wastes, *Coalescence, *Fibrous beds, Membrane processes, Resins, Separation techniques, Density, Pressure, Flow rates, Industrial wastes, Dispersion, Laboratory tests, *Waste water treatment.
Identifiers: *Fiber glass.

A laboratory scale coalescer bed was formed from standard, phenol formaldehyde coated fiber glass, consisting of 3 layers: (1) 2 inches of 10.1 micron glass of 0.6 lb/ft3 density; (2) 1/2, 1, or 1 1/2 inches of 3.2 micron glass, 0.6 lb/ft3 density; and (3) 2 inches of 10.1 micron glass, 0.61 lb/ft3. The bed was then compressed between screens to an overall thickness of 1/4 inch, giving an apparent overall density to the working membrane of 10.8 lb/ft3. By testing the cell on a synthetic oil dispersion and an actual pollutant stream, a 100% coalescence efficiency at a 7.5 gpm flow rate over the entire run time was established. Capacities, corresponding to a 25 psi pressure drop through the bed, for a 7.5 gpm flow rate were 710 gal for an 85 deg F waste and 100 gal for a 65 deg F waste. Stabilization of fibers to mechanical degradation was accomplished by coating the compressed fibers with isobutyl methacrylate resin. This medium, showing the same coalescence efficiency and pressure drop characteristics for the original medium, was regenerable by solvent treatment. Operating costs based on single use of fibers were estimated at 13 cents/1000 gal, but successful fiber regeneration would drop the cost to 1 cents/1000 gallons or less. (Lowry-Texas)
W72-09580

EFFECT OF POROUS STRUCTURE ON CARBON ACTIVATION.
Colorado Univ., Boulder. Dept. of Chemical Engineering.

Copy available from GPO Sup Doc, $1.00; microfiche from NTIS as PB-210 145, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, June 1971. 94 p, 17 fig, 13 tab, 61 ref. EPA Program 17020 DDC 06/71.

Descriptors: *Activated carbon, *Incineration, *Coals, Temperature, Heat treatment, Carbon dioxide, Nitrogen, Helium, Pressure, Diffusion, Adsorption, *Waste water treatment.
Identifiers: *Burnoff, *Reaction rate, *Activation, Macropores, Micropores, Crystallites, Preheating, Graphite.

Two carbon samples, one a calcined Elkol, Wyoming coal and the other a graphite, were reacted with gases in a carbon activation system. Reaction rates and porous structures of the coal, after activation by air and by carbon dioxide, and the graphite, after activation by carbon dioxide, were measured. Total, macropore, and micropore volumes, surface area, and pore-size distributions were measured as functions of burnoff. In 1 mm diameter calcined coal particles, the overall reaction rate was chemical rate limited at temperatures up to 961 deg C and rates as high as 106%/hour. In 19 mm diameter graphite cylinders, the rate at 1030 deg C was diffusion limited. Pore volume changes in calcined coal occurred due to heating, carbon burnoff, and opening of closed pores, whereas pore volume changes in graphite were produced mainly by end-burning of crystal-lites. Up to 12% burnoff, closed pores that were opened were micropores; above 12% burnoff they were macropores. Although pore growth can be described, it cannot yet be quantitatively predicted. However, these results have suggested that activation of carbons containing crystallites of a given size range could be a means of producing an activated carbon with pores of that size range, and further studies are recommended.
W72-09581

TOXICITY ASSESSMENT OF TREATED MUNICIPAL WASTEWATERS,
California Univ., Berkeley. Sanitary Engineering Research Lab.
L. A. Esvelt, W. J. Kaufman, and R. E. Selleck.
Preprint, presented at 44th Annual Conference of Water Pollution Control Federation, Session 9, No 5, October 5, 1971. 24 p, 4 fig, 7 tab, 12 ref.

Descriptors: *Municipal wastes, *Toxicity, *Bioassays, Pilot plants, On-site investigations, Laboratory tests, Heavy metals, Activated sludge, Biodegradation, Lime, Chemical precipitation, Activated carbon, Adsorption, Ion exchange, Resins, Ammonia, Sedimentation, Chlorination, Fish, *Waste water treatment, Water quality control.
Identifiers: *Methylene blue active substance.

Toxicity measurements, made with continuous-flow on-line fish bioassays using golden shiner, were made on municipal wastes both before and after: (1) primary treatment; (2) activated sludge treatment; (3) lime precipitation of primary effluents at pH 11 followed by recarbonation to pH 7; (4) ammonia removal from lime precipitation effluents by clinoptilolite ion exchange; (5) organics removal by activated carbon and a macroporous anionic resin; and (6) chlorination of primary, lime precipitation, and activated sludge effluents. Effluent toxicity levels for each treatment were: (1) 2.2 T. U. for primary effluent (average of 4 cities); (2) 0.5 T. U. for standard rate activated sludge; (3) 1.3 T. U. following lime precipitation-recarbonation; and (4) 0.8 T. U. following either ammonia removal or organics sorption following lime precipitation. Average toxicity removals by biological treatment were 75%, which could be equalled only by the three-step lime precipitation, sorption, and ion exchange. Toxicity increased after chlorination in proportion to the chlorine residual maintained. Dechlorination with sodium bisulfite resulted in complete removal of chlorine induced toxicity. (Lowry-Texas)
W72-09582

METHODS FOR CLEAN CONDENSATION OF ATMOSPHERIC MOISTURE FOR ITS USE IN A CLOSED ECOLOGICAL SYSTEM,
G. P. Khomchenko, S. V. Chizhov, Yu. Ye. Sinyak, V. F. Stolbov, and M. I. Shikina.
Available from the National Technical Information Service as JPRS-54502, $3.00 in paper copy, $0.95 in microfiche. Joint Publications Research Service, Translation JPRS-54502, November 1971. 9 p, 2 fig, 2 tab, 13 ref. Trans. from Izvestiya Timiryazevskoi Sel'skokhozyaistvennoi Akademii, No 5, 1971.

Descriptors: *Water reuse, *Condensation, *Respiration, *Transpiration, Separation techniques, Cation exchange, Resins, Metals, Activated carbon, Adsorption, Ammonia, Alcohols, Oxidation-reduction potential, Gamma rays, Oxidation, Laboratory tests, Waste water treatment.
Identifiers: *Hydrogen peroxide.

Atmospheric humidity condensates (AHC) are introduced into a space vehicle primarily through the breathing of the occupants. Contaminants which have been identified in AHC are such inorganics as ammonia, nitrates, nitrites, chlorides, phosphates, and sulfates of calcium, magnesium, sodium, potassium and ammonia, as well as organic impurities including lower aliphatic alcohols, fatty acids, ketones, aldehydes, and amines. Since ammonia comprises as much as 99% of the total inorganic impurities, an ion exchange system specific for ammonia was designed and evaluated for ammonia removal. Results from the resins tested indicated that KU-2X16 in. Cu++ form possessed maximal ammonia capacity. By treating the AHC by ion exchange for inorganic contaminant removal, and then subjecting the flow to activated carbon adsorption, a water was produced which was demonstrated by toxicological and biological investigations to be suitable for use as drinking water and for growing higher plants. An oxidation-reduction procedure utilizing hydrogen peroxide and gamma radiation to reduce complex, poorly-sorbed organics to easily sorbed organics or carbon dioxide was also demonstrated. (Lowry-Texas)
W72-09583

PRESENT STATUS OF THE U.S. PROGRAM ON THE SOLIDIFICATION OF HIGH LEVEL WASTES,
Batelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
A. G. Blasewitz, and K. J. Schneider.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series, No. 137, p 141-153. 4 fig, 3 tab, 18 ref.

Descriptors: *Electric power production, *Nuclear powerplants, *Radioactive wastes, Safety, Public health, Solid wastes, Storage, Cost analysis, *Waste storage.
Identifiers: *Solidification, *Calcination, *Encapsulation.

Preliminary studies have demonstrated that solidification of high level wastes from the nuclear power generation industry represents the only practical and reasonably attainable technique for substantially increasing the safety of storing such wastes. During the past 15 years, major AEC-sponsored research and development efforts have developed four basic solidification processes: (1) spray solidification; (2) pot calcination; (3) phosphate glass solidification; and (4) fluidized bed calcination. All processes are currently being demonstrated on an engineering scale, with the spray, pot, and phosphate glass solidification processes operating at 20 liters/hour on highly

radioactive wastes, and the fluidized bed calcination process operating at 300 liters/hour of moderately radioactive wastes. All processes have been thoroughly developed and are ready for commercial application. Reported costs for perpetual storage of high level wastes as liquids range from 0.03 to 0.035 mils/KW hre, and costs for storage as solids range from 0.03 to 0.05 mils/KW hre. (Lowry-Texas)
W72-09584

MAGNETIC FLOCCULATION OF STEEL MILL WASTE WATERS,
Data Graphic, Inc., Pittsburgh, Pa.
H. C. Bramer, and W. L. Gadd.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 154-165. 16 fig, 1 tab, 5 ref.

Descriptors: *Industrial wastes, *Iron, *Suspended solids, Flocculation, Separation techniques, Turbidity, Polyelectrolytes, Mixing, Sedimentation, *Waste water treatment.
Identifiers: *Magnetic flocculation, *Flux density.

Data were collected in 61 experimental runs, on steel mill wastewaters, in terms of settling rate curves. In ten of these runs, polyelectrolytes were added in concentrations of 0.5 and 1.0 mg/l prior to magnetic flocculation. Retention times in the magnetic field ranged from 0.044 to 0.133 seconds and flux density at the centerline of the magnetic flocculator varied from 600 to 1000 gauss. Only limited information could be obtained from these initial tests, but initial suspended solids concentration, polymer dosages, exposure to the magnetic field, and field intensity were indicated as important parameters in the process. A multiple linear regression technique was employed using a digital computer in an attempt to relate these parameters to the degree of solids reduction obtained without the use of polymers. Assuming standard sedimentation index values for various items of mill equipment, reductions from 44 to 50% could be theoretically predicted for the different wash waters involved through the use of magnetic flocculation at levels of about 1000 gauss. However, these conclusions are intended only as guidelines in an unquantified wastewater treatment technique. (Lowry-Texas)
W72-09585

OPERATION OF A CENTRAL WASTE TREATMENT SYSTEM-BAYPORT INDUSTRIAL COMPLEX,
Friendswood Development Co., Houston, Tex.
J. D. Bruton, Jr.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 168-173. 1 fig, 3 tab, 3 ref.

Descriptors: *Industrial wastes, *Biochemical oxygen demand, *Toxicity, Biodegradation, Organic loading, Waste dilution, Hydrogen ion concentration, Temperature, Sampling, Monitoring, Analytical techniques, Cost analysis, *Waste water treatment, Texas, Treatment facilities.
Identifiers: *Centralized waste treatment facilities, *Shock loading, *Bayport (Tex).

The Bayport Central Waste Treatment System serves various industries located on the 12,000 acre industrial development of Bayport. The waste received at the treatment plant can be of two different classes, but both classes have rigidly imposed guidelines on waste quality. The treatment plant serves mainly to reduce the BOD, and plants that have suspended solids or toxicity problems must deal with them individually. Combined wastes from the industries usually contain 3000 mg/l of BOD which is then diluted with well water to achieve a 1500 mg/l BOD level before treatment. Efficiency in the plant, as measured by BOD reduction, has been as high as 97% and is normally 90% or greater. The major difficulties which have been encountered have stemmed from measurement difficulties in finding the source of an upset in time. BOD as a control parameter has been discarded in favor of the COD and/or TOD tests. Current charges are 6 cent/1000 gallons for a clean waste stream and 40 cents/1000 gallons for a biological stream of less than 250 mg/l. For effluents over 250 mg/l BOD, the charge is 40 cents/lb of BOD. (Lowry-Texas)
W72-09586

THE OPERATION OF PRESSURE TYPE SAND FILTERS FOR HOT MILL WASTE WATERS,
Youngstown Sheet and Tube Co., East Chicago, Ind.
C. Broman.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 166-167.

Descriptors: *Iron oxide, *Oil, *Filtration, Separation techniques, Sedimentation, Head loss, Sands, Pressure, Corrosion, Suspended solids, Operation and maintenance, *Waste water treatment.
Identifiers: *Backwashing.

Hot milling is a process in which steel slabs 10 to 12 inches thick, 4 to 5 feet wide, 25 to 30 ft long, and weighing about 20 tons are heated to 2400F and continuously reduced into 60 to 70 inch wide, 15 to 20 guage metal some 2000 ft long. Wastewaters leaving a hot mill contained mostly fine iron oxide particles mixed with lubricating oils. After gravity settling in scale pits, such effluents normally contain 100 mg/l suspended solids and 20 mg/l oil. After visits to German and French installations, deep bed, pressurized sand filters were chosen as the treatment method for a new 84 in hot strip mill complex of Youngstown Sheet and Tube Company. Total filtering area of the 42 filters installed is 9000 ft2, and maximum capacity at a rate of 7 gpm/ft2 would be 3,8000,000 gal/hour. Average volume treated is 43 to 65 mgd, and effluent leaving the plant averages 3 to 5 mg/l for both oil and suspended solids. Operating costs are minimal, since operation is nearly automatic and only one operator per eight hour shift is required. (Lowry-Texas)
W72-09587

VACUUM FILTRATION - MEDIA AND CONDITIONING EFFECTS,
Colorado Univ., Boulder. Dept. of Civil Engineering.
E. R. Bennet, D. A. Rein, and D. J. Devroy.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 82-93. 11 fig, 16 ref.

Descriptors: *Sludge, *Vacuum drying, *Filtration, Heat treatment, Fouling, Solubility, Polyelectrolytes, Separation techniques, Odor, *Waste water treatment.
Identifiers: *Chemical conditioning, *Specific resistance, *Media size, *Vacuum filtration.

The interactions between filter media and the conditioning method used, and their effects on the operation of vacuum filters used in waste treatment were investigated both in laboratory and plant scale testing. The effect of media size opening was studied on two sludges. One of the sludges was a combination of fresh raw, primary, and secondary sludge from a trickling filter plant. The other sludge was of identical composition, but it had been heat treated for 1 hour at 370 deg F, settled overnight, and decanted. Two pieces of Whatman No. 4 filter paper, 100 mesh, 50 mesh, 30 mesh and 16 mesh wire screen were used as media for the raw sludge. Only the 100, 50 and 30 mesh screens were used on the treated sludge. Both heat treatment and chemical conditioning can be used to reduce the amounts of fine particles which plug the pores of vacuum filtration units. Two methods of increasing filtrate flow rates were use of a coarser filter medium, and chemical or heat treatment, but each of these methods has disadvantages as well as advantages which must be accounted for. (Lowry-Texas)
W72-09588

THE CLARIFICATION OF PAPER MILL EFFLUENTS BY ACTIVATED CARBON PRODUCED FROM WASTE SULFITE LIQUOR AND OTHER REFUSE,
Copeland Systems, Inc., Oak Brook, Ill.
G. G. Copeland, and G. R. Smithson, Jr.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 239-248, 2 fig, 5 tab, 5 ref.

Descriptors: Pulp and paper industry, *Pulp wastes, *Industrial wastes, *Color, *Activated carbon, *Adsorption, Wood wastes, Chemical oxygen demand, Separation techniques, Incineration, Temperature, Hydrogen ion concentration, *Waste water treatment.
Identifiers: *Container-Copeland process.

Earlier investigations have demonstrated the ability of powdered activated carbon to remove 90-99% of the color and 82-83% of the COD from a kraft mill effluent. The Container-Copeland system for waste treatment produces a certain amount of activated carbon in the process of treating neutral sulfite semichemical pulping waste as well as other types of pulping liquors. A preliminary laboratory study was conducted in order to assess the feasibility of utilizing this carbon to adsorb color bodies in a paper mill effluent. Optimum decolorization was accomplished by treating 200 ml of mill 'whitewater' for 24 hours with 5g of carbon from the cyclone dust which had been activated at 1600 deg. F for 60 min. in carbon dioxide. This treatment resulted in removals of 60% of the color bodies from the mill effluent. The success of the preliminary tests has suggested possible modifications to existing systems to increase the amount of carbon produced, including: (1) addition of sawdust or fine wood chips to the fluidized bed system in the freeboard; (2) control of oxygen levels in the incinerator to enhance carbon production; (3) mixing of spent carbon from decolorizing to the feed liquors for disposal and/or regeneration; and (4) recirculation of spent carbon to the fluidized bed unit. (Lowry-Texas)
W72-09589

ALGAL INFLUENCES ON DIEOFF RATES OF INDICATOR BACTERIA,
Texas Univ., Austin. Coll. of Engineering.
E. M. Davis, and E. F. Gloyna.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 266-273, 1 fig, 4 tab, 17 ref.

Descriptors: *Enteric bacteria, *Water quality, *Domestic wastes, Algae, Industrial wastes, Metabolism, Growth rates, Oxidation lagoons, Coliforms, Nutrients, Analytical techniques, Microbiology, *Waste water treatment.
Identifiers: *Aftergrowth.

Destruction of coliform bacteria in waste treatment facilities has been attributed to a number of physical, biological, and chemical factors. However, several species of algae appear to be capable of stimulating specific coliform organisms, through algal metabolic exudates which are released during log growth conditions and from nutrients which may be released after death of the algae. Investigations of behavioral patterns of selected species of enteric bacteria when in the presence of single axenic cultures and mixed cultures of selected blue-green and green algae, and investigations of the behavior of enteric bacteria in the presence of algae and known quantities of industrial waste were conducted. Results indicated that Alcaligenes faecalis, Enterobacter aerogenes, and Proteus vulgaris exhibited only limited tendencies for aftergrowth, while Escherichia coli,

Pseudomonas, and Serratia Marcescens showed distinct aftergrowth capabilities in all test environments used. These investigations demonstrated that the organisms which are used as pollution indicators may appear in numbers seeming to indicate domestic wastewater pollution when none is present. (Lowry-Texas)
W72-09590

HANDLING WASTE DISPOSAL AT A MAJOR FOOD PLANT,
Campbell Foods, Inc., Napoleon, Ohio.
F. T. Dubyne.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 304-305.

Descriptors: *Food processing industry, *Vegetable crops, *Byproducts, Liquid wastes, Solid wastes, Sedimentation, Aeration, Trickling filters, Chlorination, Incineration, Landfill, Management, Regulations, Monitoring, Industrial wastes, *Waste water treatment, Waste disposal, Water reuse, Ohio.
Identifiers: *Napoleon (Ohio).

Wastes generated at the Campbell Soup Company plant in Napoleon, Ohio can be separated into the two categories, wet and dry. Wet wastes include wash water, cooking water, carriage water, water treatment plant sludge, and waste treatment plant supernatant liquor and sludge. Dry wastes are comprised mainly of packaging materials of paper, cardboard, plastic, and metal. All liquid waste which is not recoverable is screened and subjected to modified secondary treatment, with the exception of tomato wash water which is disposed of by spray irrigation. Non-recoverable solid waste is landfilled, paper wastes are baled and resold, and non-saleable paper is incinerated. Spent bone, dried vegetable waste, and tomato trimmings are all reprocessed and sold. By keeping informed of state and national programs, and anticipating the actions of regulatory agencies, the Campbell Foods Company has been able to keep its operations running smoothly while maintaining good relations with regulatory agencies and surrounding neighbors. (Lowry-Texas)
W72-09591

THE CHARACTERISTICS OF RESIDUES IN SPENT CHLORINATION LIQUOR,
State Univ. of New York, Syracuse. Coll. of Forestry.
C. W. Dence, and M. Ota.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 283-293, 2 fig, 5 tab, 17 ref.

Descriptors: *Kraft mill wastes, *Chlorination, *Chemical analysis, Pulp and paper industry, Separation techniques, Analytical techniques, Solubility, Oxidation, Hydrolysis, Lignin, Water quality control, *Waste water treatment, *Pulp wastes.
Identifiers: *Waste characterization, *Alkali extraction.

A partial characterization of organic solids in commercial kraft spent chlorination liquor has indicated that the dissolved solids are composed largely of degradation products from the lignin component of the pulp. Although the residues were shown to contain substantial amounts of chlorine, the structural implications of 'chlorolignin' must be discarded in favor of acyclic (non-aromatic) products originating from oxidative rupture of the phenolic moiety of the lignin unit. These acyclic products probably consist of unsaturated dibasic acids of varying chain lengths to which are attached chlorine atoms and probably enolic hydroxyl groups resulting from hydrolysis of the chloro substituents. Ether extraction of spent chlorination liquor resulted in recovery of approximately one-third of the total solids as low molecular weight material. Alakli extraction produced changes such as chlorine removal, loss of carbonyl groups, and an apparent decrease in the number average molecular weight. Such changes undoubtedly have an important effect on the color and solubility of the resulting material and should be more comprehensively studied for these reasons. (Lowry-Texas)
W72-09592

STABILIZATION OF REFINERY WASTE WATER WITH THE ACTIVATED SLUDGE PROCESS: DETERMINATION OF DESIGN PARAMETERS,
Shell Development Co., Emeryville, Calif.
R. L. Dickenson, and J. T. Giboney.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 294-303, 6 fig, 2 tab, 8 ref.

Descriptors: *Activated sludge, *Oil wastes, *Laboratory tests, Biodegradation, Analytical techniques, Sludge, Oxygen, Aeration, Mixing, Suspended solids, Biochemical oxygen demand, Design criteria, *Waste water treatment.
Identifiers: *Substrate removal rate, *Acclimatization.

Eight continuous feed, laboratory scale biotreaters were assembled and operated on refinery wastewaters to determine: (1) substrate removal rate; (2) oxygen utilization rate; (3) oxygen mass transfer efficiency; and (4) sludge production rate. Substrate removal rates were evaluated both for constant and variable feed composition; the other parameters were determined from constant composition feed runs. The reduction in toxicity of the effluent produced by treatment was measured by toxicity bioassays, (TLm96) using Sticklebacks. Results of the investigations were compared with previous work and found to be within reasonable agreement. One observation of particular significance was the finding that, with sufficiently long periods of acclimation, the biota in an activated sludge plant can acquire the capacity to metabolize normally refractory components, such as tertiary butyl alcohol and others. (Lowry-Texas)
W72-09593

PLATING AND INDUSTRIAL WASTE TREATMENT AT THE EXPANDED PLANT OF FISHER BODY, ELYRIA, OHIO,
General Motors Corp., Elyria, Ohio. Fisher Body Div.
R. A. Fisco.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 306-313, 4 fig.

Descriptors: *Industrial wastes, *Oxidation, *Neutralization, *Chemical precipitation, Separation techniques, Lime, Hydrogen ion concentration, Coagulation, Chlorination, Sludge, Vacuum drying, Filtration, Chromium, *Waste water treatment, Ohio.
Identifiers: *Metal-bearing wastes, *Cyanide, *Elyria (Ohio).

The Fisher Body Plant of Elyria, Ohio generates 1.5 mgd of liquid wastes in the processes of plating, anodizing, and hardware manufacturing. The four general types of wastes produced include: (1) acid-alkali or metal-bearing wastes; (2) chromic acid wastes, i.e., solutions composed of primary, secondary, and tertiary chrome rinses; (3) cyanide wastes and rinses; and (4) cleaners, pre-soaks, detergents, wetting agents, etc. Principal treatment for metal-bearing wastes is lime neutralization and sufficient detention time to allow metallic-hydroxide sludge formation and settling. Expansion of capacity has allowed conversion from continuous flow to batch treatment with significant increases in process control. Chrome waste treatment involves removal of SO2 from power house stack gases by the liquid chrome wastes and use of the SO2 as a chemical reducing agent to convert hexavalent chrome to the trivalent stage, followed by lime neutralization and chromium hydroxide precipitation. Cyanide treatment consists mainly of oxidation with chlorine and dilution with other wastes. Chemical cleaners are isolated, acidified, coagulated, and neutralized. Each of these waste streams had to be isolated, at considerable cost, to make treatment of the wastes both technically and economically feasible, but in doing so, the obligations of this particular industrial plant to its community have been met. (See also W71-05085) (Lowry-Texas)
W72-09594

TESTING NEW SEWER PIPE INSTALLATIONS,
Ramseier (Roy Edwin) and Associates, Berkeley, Calif.
R. E. Ramseier.
Journal Water Pollution Control Federation, Vol 44, No. 4, April 1972. p 557-564, 5 ref.

Descriptors: *Sewerage, *Watertight, *Construction joints, *On-site tests, Infiltration, Leakage, Porosity, Orifices, Pipes, Flow rates, Head loss, Specifications, Repairing, Sealants.
Identifiers: *Air testing, *Water testing.

Sewerage systems are in the best condition of their service life immediately after installation. Since their condition will continually deteriorate during the rest of their service life, it is imperative that the sewer lines start out in as good a condition as possible. Air testing of sewer lines is a useful and accurate method for testing sewerage systems for leakage. There is now sufficient correlation among the various specifications in use to warrant the adoption of uniform specifications for determining pipe soundness. However, to allow for the use of pipes having varying porosities, specifications should be capable of being changed by the alteration of one number, and such specifications have been proposed. No correlation between the air test and the water test has been obtained since the surface tension of water determines some of the flow characteristics through increasingly smaller orifices. (Lowry-Texas)
W72-09595

ORGANIC CONCENTRATION AND HYDRAULIC LOADING VERSUS ORGANIC LOADING IN EVALUATION OF TRICKLING FILTER PERFORMANCE,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
E. E. Cook, and D. F. Kincannon.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 230-238, 11 fig, 15 ref.

Descriptors: *Trickling filters, *Organic loading, *Flow rates, Efficiencies, Sampling, *Chemical oxygen demand, Biodegradation, Analytical techniques, Laboratory tests, *Waste water treatment.
Identifiers: *Hydraulic loading.

A laboratory scale, fixed bed trickling filter was assembled and operated on influent flows ranging from 100 to 300 gpd/ft2, and on substrate concentrations in the various flow ranging from 100 to 500 mg/l of sucrose. Performance of the filter was determined by measuring both influent and effluent COD to determine the amount of COD removed. Results demonstrated that the total COD applied to the filter (gm COD/hr/ft2), rather than either flow rate or concentration of feed in the influent flow, determined the performance of the trickling filter. COD removal was at the same efficiency with the same total organics applied regardless of whether the organics were applied in low concentrations in a high flow or high concentrations in a low flow. As a result, residence or contact time has no bearing on COD removal when observed over the range of organic and hydraulic loadings investigated since it is determined solely by the flow rate. (Lowry-Texas)
W72-09596

ELECTRICALLY INDUCED COAGULATION OF LIGNIN FROM KRAFT MILL WASTEWATERS,
Maine Univ., Orono. Dept. of Civil Engineering.

Proceedings , Industrial Waste Conference 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 203-213, 12 fig, 1 tab, 8 ref.

Descriptors: Pulp and paper industry, *Pulp wastes, *Bleaching wastes, *Color, *Lignins, Electrochemistry, Electeolysis, Electrolytes, Electrodes, Oxidation, *Coagulation, Flotation, Electric currents, Temperature, Kraft mill wastes, *Waste water treatment.
Identifiers: *Power consumption.

A laboratory scale electrolytic cell was used to determine the effects and interrelationships of several parameters in the electrolytic removal of color from kraft pulp mill bleaching wastewaters. Applied current, time, electrode area and spacing, temperature, and electrolytic dosage were varied to establish the general trends of the electrolytic process. 95 to 97% color removal was obtained within the range of applied current. However, raising the current from 1.2 amp to 7.2 amps decreased the removal time from 25 min to 5 min. Further investigations demonstrated that the 1.2 amp current was superior to the 7.2 amp current in that power consumption was minimized and system heating was prevented. Variation of electrode size and spacings demonstrated that an optimal system would contain infinitely large electrodes a very small distance apart. Finally, addition of an electrolyte, calcium chloride, from 10 mg/l to 300 mg/l caused a decrease in power consumption from 41 Kwh/1000 gal to 13 Kwh/1000 gal. By accounting for each of the effects, the system can produce more nearly optimal removals of color from kraft wastewaters. (Lowry-Texas)
W72-09597

MULTI-STAGE PLASTIC MEDIA TREATMENT PLANTS,
Imperial Chemical Industries Ltd., Brixham (England).
N. J. Chipperfield, M. W. Askew, and J. H. Benton.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 214-229, 6 fig, 7 tab, 15 ref.

Descriptors: *Trickling filters, *Plastics, *Biodegradation, Sludge, Flow rates, Organic loading, Hydrogen ion concentration, Nutrients, Industrial wastes, Design criteria, Flexibility, Operation and maintenance, *Waste water treatment.

Plastic-packed trickling filters, in either the single or multi-stage configuration are becoming increasingly widespread in their usage. Examples given are of treatment of distillery effluents, brewery wastes, dairying effluents, fruit and vegetable processing wastes (canning and quick frozen), synthetic fiber wastes, pharmaceutic wastes, and combined municipal-industrial wastes. Primary advantages of plastic-packed filters include: (1) ability to treat a wide variety of wastes to nearly any level desired; (2) greater robustness and tolerance in operation, particulary with regard to shockloading or toxic materials; (3) extensive pretreatment, other than pH correction to 6.0 to 8.5 and supplies of appropriate nutrients, is not required; (4) greater operational flexibility; (5) production of humus sludges of constant characteristics which are easily handled, dewatered, and disposed of; (6) simplicity of operation and maintenance, even with automatic controls, and (7) minimal land requirements while retaining the ability to lend itself to unit design and construction. In addition to these and other benefits, the rapidly growing number of such installations in operation and in planning is ample evidence of the economic attractiveness as well. (Lowry-Texas)
W72-09598

CHEMICAL TREATMENT OF SPENT VEGETABLE TAN LIQUOR,
Radford Coll., Va.
W. A. Barkley, P. H. King, R. H. Myers, and C. W. Randall.
Proceedings, Industrial Waste Conference, 25th, May 7-10, 1970, Purdue University Engineering Extension Series No. 137, p 69-81, 13 fig, 2 tab, 9 ref.

Descriptors: *Tannery wastes, *Industrial wastes, *Coagulation, Analytical techniques, Polyelectrolytes, Mixing, Hydrogen ion concentration, Turbidity, Color, Chemical oxygen demand, *Waste water treatment.
Identifiers: *Alum, *Total volatile solids, *Tannin, Spent vegetable tan liquors, *Chemical treatment.

Volatile suspended solids, turbidity as light scattering, volume of coagulated phase, turbidity as percent transmission, filtration time of volatile suspended solids, and COD have all been used as major control parameters in measuring the results of coagulation tests. Since several previous tests had indicated that the greatest reliability was obtained using the total volatile solids parameter, the percent reduction in total volatile solids was used as the primary variable or response in laboratory tests designed to determine how to best measure coagulation test results for spent tan liquor. Total volatile solids, Tannin, and COD were demonstrated as suitable response parameters and 90% color removal from spent tan liquor wastes was achieved using an alum-polyelectrolyte chemical coagulation system. A seven to one total volatile solids to alum ratio gave maximum removal efficiency for alum concentration, and the optimum time interval between addition of alum and anionic polyelectrolyte was established at 3 min. (Lowry-Texas)
W72-09599

THE TREATMENT OF INDUSTRIAL WASTEWATER FOR REUSE--CHRYSLER INDIANAPOLIS FOUNDRY,
Chrysler Corp., Detroit, Mich.
A. R. Balden, and P. R. Erickson.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 62-68, 5 fig, 4 tab.

Descriptors: *Industrial wastes, *Iron compounds, *Oil wastes, Phenol, Suspended solids, Flocculation, Sedimentation, Adsorption, Lime, Hydrogen ion concentration, Sludge, Vacuum drying, Landfills, *Water reuse, Design, *Waste water treatment.
Identifiers: *Foundries.

Effluent wastewater from the Chrysler Corporation's Indianapolis Foundry contains 1900 mg/l suspended solids, 770 mg/l dissolved solids, 390 mg/l oil (petroleum ether extract), and 1.5 mg/l phenol. Other plants with similar wastewaters were visited and laboratory tests performed to determine the settling characteristics. The discharge requirement of 300 mg/l suspended solids was selected as the controlling factor and clarifier was designed for a 1200 gpm influent, a 600 gpd/ft2 surface overflow rate, and a 2 hour detention time, with chemicals available as needed. Slurry recirculation was provided and later demonstrated to develop faster settleability, provide greater clarifier stability over varying feed conditions, and aid in greater sludge compaction. Reductions of suspended solids from 2000 mg/l to less than 60 mg/l were achieved, and analysis of the filter cake revealed that the iron particles present in the waste had adsorbed much of the oil. Treated wastewater is then reused in the gas quenching system and will soon be recycled to the external cupola cooling system. (Lowry-Texas)
W72-09600

ARCTIC WASTE MANAGEMENT,
Alaska State Dept. of Health and Welfare, College.
A. J. Alter, S. E. Clark, and E. K. Day.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 17-25, 1 fig, 5 tab.

Descriptors: *Alaska, *Cold regions, *Water consumption, *Water reuse, Climatic zones, Separation techniques, Filtration, Activated carbon, Adsorption, Chlorination, Disinfection, Incineration, Suspended solids, Water treatment, Oil, *Waste water treatment, Waste disposal.
Identifiers: *North Slope.

Discovery of rich oil-bearing lands on Alaska's North Slope has prompted the establishment of many permanent, semi-permanent, and mobile camps housing workmen developing these resources. However, the frozen environment that prevails in Alaska makes water supply and wastewater and solid waste disposal an acute problem. Since water is so valuable, reuse schemes must be developed, and since heated space is also valuable, all equipment must be kept to a minimum. The reuse scheme selected involves water use for drinking and culinary purposes, treatment of that effluent for use in showering and laundry, treatment of showering and laundry effluent for use as toilet flushing water, and incineration of solids from toilet flushing water, organic removal, disinfection, and reuse for toilet flushing. A physical chemical package plant treatment system using a solids contact clarifier, two-stage countercurrent carbon adsorption for filtration and organics removal, optional chlorination, and waste solids incineration has been selected for evaluation. Tests are currently being performed in Cincinnati, and full-scale field tests in Alaska are scheduled beginning in July 1970. (Lowry-Texas)
W72-09601

BIOLOGICAL FACTORS IN AERATOR PERFORMANCE,
Rice Univ., Houston, Tex.
A. W. Busch.
Proceedings, Industrial Waste Conference, 25th, May 5-7, 1970, Purdue University Engineering Extension Series No. 137, p 174-181, 3 fig, 1 tab, 18 ref.

Descriptors: *Aeration, *Oxygenation, *Efficiencies, Turbulence, Mixing, Chemical oxygen demand, Biochemical oxygen demand, Dissolved oxygen, *Waste water treatment.
Identifiers: *Oxygen transfer, *Zone of influence, *Reaction rates, Power requirements.

Investigations by previous authors have demonstrated that as long as mixing is adequate, but not excessive, the type of aerator used has no effect on the oxygenation capacity of the system, since the rate of oxygen transfer is set by rate and net stoichiometry of the biological reaction in a particular system. By the same reasoning, the efficiency of a particular aerator is determined by the system. Mixing capability of aeration devices remains largely an undefined area, however, and the following performance specifications have been suggested to help obtain mixing information. Aerator performance shall be deemed satisfactory when: (1) suspended solids concentration of the mixed liquor shows less than 20% variation (plus or minus 10% from the mean) in the zone of influence stipulated by the manufacturer; (2) DO concentration shows less than 50% decrease from the maximum value in the manufacturer's stipulated zone of influence; and (3) O2 transfer, measured by difference in influent and mixed liquor COD is shown to be at least 50 lb O2/motor hp/day with an X mg/l minimum DO concentration in the manufacturer's stipulated zone of influence. (Lowry-Texas)
W72-09602

MICROBIOLOGICAL CHARACTERIZATION OF ACTIVATED SLUDGE IN A WASTEWATER TREATMENT PLANT CHEMICALLY MODIFIED FOR PHOSPHOROUS REMOVAL,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.

R. F. Unz.
Available from the National Technical Information Service as PB-210 157, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, December 1971. 24 p, 3 fig, 2 tab, 23 ref. OWRR A-018-PA (1).

Descriptors: *Waste water treatment, Sludge treatment, *Aeration, *Activated sludge, *Aerobic bacteria, *Coliforms, *Streptococcus, Phosphorous, Protozoa, Microorganisms.
Identifiers: Aluminum sulfate, *Chemical-biological treatment.

Microbiological research was conducted on a dual, secondary wastewater treatment system which was part of The Pennsylvania State University wastewater treatment plant. Each aeration basin received identical wastewater which was the effluent from a high rate trickling filter. One of the aeration basins was dosed with aluminum sulfate for the purpose of phosphorous removal. The other aeration basin (control) was operated in the conventional manner without alum addition. Plate counts performed on combined chemical-biological sludge and control activated sludge revealed that a higher number of viable microorganisms was contained in the chemical-biological sludge, but the magnitude of difference between the two sludges was significant depending on the culture medium employed. Results suggest the aluminum flocs formed in the chemical-biological treatment enmesh dispersed wastewater microorganisms, some of which are qualitatively unlike those indigenous to natural activated sludge. The combined chemical-biological sludge contained significantly higher numbers of lipolytic, gelatinolytic, and thiosulfate oxidizing microorganisms and, possibly, fewer nitrate oxidizing microorganisms than did control activated sludge. Alum did not appear to affect flagellated protozoa in mixed liquor; however, amoeboid and ciliated protozoa were found less frequently than in control mixed liquor. The settled effluent from the combined chemical-biological aeration basin generally contained fewer total coliforms, fecal coliforms, and fecal streptococci than did counterpart control effluents.
W72-09654

WATER QUALITY CONTROL IN OREGON.
Oregon State Dept. of Environmental Quality, Portland.
For primary bibliographic entry see Field 05G.
W72-09669

SUMMER CONFERENCE OF SOCIETY FOR APPLIED BACTERIOLOGY, LIVERPOOL, 13--15 JULY 1971,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 05C.
W72-09675

PLANT SCALE REACTIVATION AND REUSE OF CARBON IN WASTEWATER RECLAMATION,
Neptune Microfloc, Inc., Corvallis, Oreg.
G. Culp, and A. Slechta.
Water and Sewage Works, Vol. 113, No. 11, p 425-431, November 1966. 2 fig, 3 tab, 3 ref.

Descriptors: *Water treatment, *Sanitary engineering, *Activated carbon, Costs, *Waste water treatment, *Carbon, *Treatment facilities, California.
Identifiers: *Carbon regeneration, *Lake Tahoe (Calif).

At the 2.5 mgd tertiary sewage treatment plant at So. Lake Tahoe, activated carbon has been very effective in removing organic materials. Efficient regeneration of the carbon is provided. For each mg of effluent about 740 lbs of carbon is removed through a 2 in. pipeline to two spent carbon tanks (coal-tar epoxy coating) with screened drain for dewatering the carbon to 43 percent moisture in 1 hr. Carbon is moved by a variable speed stainless steel screw conveyor, capacity 40 to 250 lbs/hour, discharging into the top of the regeneration furnace. The carbon moves downward through the six hearths each equipped with gas-air control burners. Steam can be added also. The regenerated carbon is discharged from the bottom of the furnace into a quench tank, from which it is pumped to the regenerated carbon storage tank, where it is washed to remove any fine carbon. Regeneration is controlled by hourly determination of the apparent density of the carbon - it decreases with destruction of the absorbed organics to a final apparent density of 0.49. Ash content is also monitored. Carbon loss has averaged less than 10 percent per regeneration cycle. Cost to regenerate and make up one pound of carbon was only one-sixth the cost of virgin carbon. Regeneration costs are only 3.8 cents per one thousand gallons of effluent. (Bean-AWWARF)
W72-09688

DECONTAMINATION OF RADIOACTIVE AQUEOUS EFFLUENT BY THE CALCIUM-FERRIC PHOSPHATE PROCESS,
Australian Atomic Energy Commission, Coogee.
For primary bibliographic entry see Field 05F.
W72-09692

MEASUREMENT AND CONTROL OF PARTICULATE MATTER IN FILTER EFFLUENTS,
Flint Water Utility, Mich.
For primary bibliographic entry see Field 05F.
W72-09693

A METHOD FOR PREDICTING THE PERFORMANCE OF NATURAL DRAFT COOLING TOWERS.
Pacific Northwest Water Lab., Corvallis, Oreg.

Copy available from GPO Sup Doc, $0.75; microfiche from NTIS as PB-210 125, $0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1970. 69 p, 13 fig, 3 tab, 7 ref. EPA Program 16130 GKF 12/70.

Descriptors: *Cooling towers, *Cooling water, *Thermal pollution, Thermal powerplants, Energy dissipation, Evaporation, Mathematical models, Computer programs, *Model studies, *Forecasting.
Identifiers: *Natural draft.

A method that does not assume saturated air at the top of the packing is developed for analyzing the performance of counterflow and crossflow natural draft cooling towers. Types of cooling towers and the principles of operation are considered. Simplified differential equations for the heat and mass transfer relations and the methods of integrating them for both counterflow and crossflow towers are given. A large number of integration steps is unnecessary. Equations for estimating the pressure losses in the tower are also given. Simplified flow charts using these integration schemes show how the computer program is used to evaluate tower performance. The computed performance of towers of various heights operating in moist and in dry conditions is shown. The effect of inlet water temperature is significant. The computed performance of a given tower with fixed inlet water temperature is shown as a function of relative humidity and dry bulb air temperature. The computer program and instructions for its use are included. (Eagle-Vanderbilt)
W72-09726

HAZELWOOD POWER STATION - DATA COLLECTION AND ANALYSIS OF COOLING POND PERFORMANCE,
State Electricity Commission of Victoria, (Australia). Hydrology, Civil and Architectural Dept.
D. M. Thompson.
Presented at 4th Australasian Conference on Hydraulics and Fluid Mechanics, Nov. 29-Dec 3, 1971, Monash University, Melbourne, Australia. 15 p, 9 fig, 7 ref.

Descriptors: *Water temperature, *Forecasting, Density currents, Instrumentation, Surveys, Wind velocity, Intakes, Mixing, Mathematical models, *Ponds, *Thermal pollution.
Identifiers: *Cooling ponds, Hazelwood Power Station, Throne formula.

The Hazelwood Power Station, of 1600 Mw installed capacity, is the first development by the State Electricity Commission of Victoria to use an artificial lake for cooling purposes. It was concluded as a result of temperature and flow studies that early work by Throne provides a rapid method of estimating operating temperatures, but his assumption of uniform surface temperature results in over-estimation of inlet conditions. A much closer estimate of actual operating conditions can be obtained by dividing the pond into a large number of stages, however interfacial mixing must be taken into consideration. The sources of error in the present method of analysis are in the estimation of wind velocity over the pond and the natural surface temperature. The modified Curtis method predicted the inlet water temperatures at Hazelwood Power Station with an accuracy of plus or minus 1.5 F. (Upadhyaya-Vanderbilt)
W72-09737

AIR COOLING FOR CONDENSATION AND EXHAUST HEAT REJECTION IN LARGE GENERATING STATIONS,
Maschinenfabrik Augsburg-Nuernberg A.G., Nuremberg (West Germany).
H. Heeren, and L. Holly.
Proceedings of the American Power Conference, Vol 32, April 21-23, 1970, Illinois Institute of Technology, Chicago, p 579-594. 13 fig, 1 tab, 10 ref.

Descriptors: *Cooling towers, *Heat exchangers, Economics, *Thermal pollution, Efficiencies, Temperature, Automation, *Cooling, Condensers, Powerplants.
Identifiers: *Dry cooling tower, *Spray condensers, *Circulating pumps, Turbine exhaust, Aluminum fins.

In view of the increasing water shortage in highly industrialized countries, dry cooling tower installations are being considered as an attractive solution. Two different concepts of dry cooling systems are air-cooled surface condensers, known as the direct system and spray condensers in conjunction with air-cooled water-to-air heat exchangers, known as the indirect system. It is believed that large diameter piping and operational difficulties impose limitations on the application of the direct system to large power plants. Spray condensers, circulating pump units, heat exchanger elements and cooling towers are the main parts of the indirect air cooling system and are described in detail. The experience from existing units and research data obtained in numerous experiments have demonstrated the feasibility of economical and reliable installations of this type. (Upadhyaya-Vanderbilt)
W72-09738

CONDENSER SELECTION FOR VARIOUS COOLING WATER SYSTEMS,
Commonwealth Associates Inc., Jackson, Mich.
R. W. Potts.
Proceedings of the American Power Conference, Vol. 32, April 21-23, 1970. Illinois Institute of Technology, Chicago, p 351-354, 1 tab.

Descriptors: Regulation, Cooling towers, Economics, *Thermal pollution, *Condensers, *Design, *Cooling, Costs.
Identifiers: *Condenser selection, Cooling ponds, Once-through cooling.

The significance of condenser design parameters as affected by the cooling water system must be adjusted to reflect limits imposed by regulations, as well as economic limits imposed by the system supplied. Condenser parameters discussed include number of passes, quantity of surface, quantity of

cooling water, and tube diameter and material. The different cooling systems discussed include natural sources - lakes, rivers; cooling towers - natural draft, mechanical draft; and cooling ponds - recirculation, once through. For estimating operating costs for each system, heat rate, KW adjustment for maximum peak capability, and maintenance cost must be considered. With all the above factors incorporated, the relative costs can be analyzed and a system can be selected to meet the objectives of economic design, coupled with conservation of natural resources. (Upadhyaya-Vanderbilt)
W72-09739

MODEL STUDIES AND DESIGN OF THERMAL OUTFALL STRUCTURES--QUAD-CITIES NUCLEAR PLANT,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
S. C. Jain, W. W. Sayre, Y. A. Akyeampong, D. McDougall, and J. F. Kennedy.
IIHR Report No. 135, September 1971. 101 p, 56 fig, 5 ref.

Descriptors: *Heated water, *Model studies, *Mixing, Hydraulics, Temperature, Mathematical models, River flow, Computer programs, Nuclear powerplants, *Design, *Outlets, Structures, *Discharge (Water), Discharge coefficient, *Thermal pollution.
Identifiers: Thermal outfall, Quad-cities Nuclear Plant, Diffusers, Similitude.

The thermal-hydraulic design of the outfall structure for the condenser-water discharge from two 800 Mw units of Quad-cities Nuclear Power Plant, located on the east bank of the Mississippi River was investigated. 2270 cfs of cooling water is used and returned to the river at a temperature 23 F above ambient. A thermodynamic energy balance indicated that the temperature rise criteria could be satisfied only if the condenser-water discharge were nearly completely mixed with the river flow. A multiport diffuser buried in the river bed was proposed. Model tests demonstrated that the ports inclined at an angle of 20 degrees from the horizontal produced no river bed scouring. Tests also indicated that no condenser water should be discharged within about 800 feet of the east bank about 120 feet of the west bank. Two mathematical models, programmed for computer execution, were used to predict the hydraulic behavior of the manifold. (Upadhyaya-Vanderbilt)
W72-09740

POWER PLANT SITING, PERFORMANCE, AND ECONOMICS WITH DRY COOLING TOWER SYSTEMS,
Hudson Products Corp., Houston, Tex.
E. C. Smith, and M. W. Larinoff.
Proceedings of the American Power Conference, Vol. 32, April 21-23, 1970. Illinois Institute of Technology, Chicago, p 544-572, 38 fig, 2 tab, 16 ref.

Descriptors: *Powerplants, *Sites, *Performance, Economics, *Cooling towers, Turbines, Temperature, Condensers, Costs, History, Fuels, Transmission, *Operating costs, *Thermal pollution.
Identifiers: *Dry cooling towers, Makeup water, Condenser pressure.

The dry cooling tower system allows the Utility System Planning Engineer virtually unlimited freedom in selecting new powerplant sites, or in adding to existing installations. Optimization studies show that the lowest total owning and operating costs with dry cooling tower systems occur with turbine exhaust pressure in the range of 8 in. Hg abs and above. Where makeup water is available, plant costs alone generally cannot economically justify the installation of a dry cooling tower system. Advantages of the dry cooling system include elimination of winter icing and fog problems, reduction of land acreage requirements, elimination of condenser tube leaks which contaminants boilerfeed condensate, reduction of the condensing-cooling system maintenance cost because of its 'dry' exterior design and all-metal construction, and reduction of field erection labor. (Upadhyaya-Vanderbilt)
W72-09741

5E. Ultimate Disposal of Wastes

THE POTENTIAL CONTRIBUTION OF DESALTING TO FUTURE WATER SUPPLY IN NEW MEXICO,
Southwest Research Inst., San Antonio, Tex.
For primary bibliographic entry see Field 03A.
W72-09306

DISPOSAL OF SOLID ALUMINUM PROCESS WASTES IN THE OCEAN,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05C.
W72-09552

THE ROLE OF THE U.S. GEOLOGICAL SURVEY IN WASTE DISPOSAL MONITORING,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 05B.
W72-09616

5F. Water Treatment and Quality Alteration

INVESTIGATION AND MEASUREMENT OF RADIUM IN RAMSAR MINERAL WATER,
Tehran Univ. (Iran). Dept. of Environmental Health.
For primary bibliographic entry see Field 05B.
W72-09266

WATER TREATMENT PLANT STAGING POLICY,
Illinois State Water Survey, Urbana.
K. P. Singh, and C. G. Lonnquist.
Water Resources Bulletin, Vol 8, No 2, p 239-249, April 1972. 6 fig, 8 ref.

Descriptors: *Discount rates, *Water demand, *Growth rates, *Water treatment, *Model studies, *Optimization, *Operations research.
Identifiers: *Treatment plant staging, *Staging policies, *Staging design efficiency.

In designing a water treatment facility for an area where water requirements are expected to increase with time, questions as to the initial size of the treatment plant and the timing of capacity additions and/or replacements over the period of study or time horizon must be answered in the context of an optimal staging policy. Various staging policies are investigated to find the most economical. A high magnitude of percent savings can be achieved by adopting a staging instead of a no-staging policy. Percent savings are dependent upon a host of parameters which must be evaluated for the particular situation; parameters are listed and evaluated in terms of this study. A computer program, written to yield the optimum staging periods, is presented. Results indicate that plant-staging design efficiency has a significant effect on percent savings. Optimum percent savings for a given growth rate of water requirement decrease with reduction in discount rate and/or the initial water requirement. Optimum savings are greater for treatment plants with longer service life, which is indicative of better treatment plant design. (Bell-Cornell)
W72-09289

IODINE COLORIMETER.
Beckman Instruments, Inc., Fullerton, Calif. Advanced Technology Operations.
For primary bibliographic entry see Field 05A.
W72-09322

MAGNESIUM CARBONATE, A RECYCLED COAGULANT FOR WATER TREATMENT.
Gainsville Dept. of Public Utilities, Fla.

Copy available from GPO Sup Doc, $1.00; microfiche from NTIS as PB-209 938, $0.95. Environmental Protection Agency Water Pollution Control Research Series, June 1971. 106 p, 21 fig, 39 tab, 93 ref. EPA Program 12120, ESW 06/71.

Descriptors: *Magnesium carbonate, *Coagulation, *Chemical precipitation, *Lime, Color, Turbidity, Alkalinity, Hardness (Water), Sludge, Filtration, Clays, Hydrogen ion concentration, Carbon dioxide, Flotation, Cost analysis, *Water treatment.
Identifiers: *Alum.

Laboratory investigations into the use of magnesium carbonate instead of alum for coagulation have demonstrated that the magnesium carbonate system produces a treated water with superior characteristics compared to water treated with alum. Both turbidity and organic color removals were comparable for both processes, and the flocs formed by the magnesium carbonate process were larger and heavier than alum flocs with better settling characteristics. The process involves the use of the magnesium carbonate as a coagulant and lime is added to precipitate gelatinous Mg (OH)2. The sludge, composed of a slurry of Mg (OH)2, CaCO3, and clay is carbonated and the Mg (OH)2 selectively and completely dissolved. Recycle after filtering allows re-use of both the magnesium carbonate and the sludgewater. CaCO3 can also be recovered easily in large plants or landfilled at small ones. An optimal dosage relationship determined for 17 natural waters is: Optimum MgCO3.3H2O dosage (mg/l) = 8.33 + .03 (turbidity-mg/.l) + 0.46 (organic color-mg/l) .03 (total alkalinity-mg/l) + .14 (total hardness-mg/l). Chemical treatment costs for most waters can be substantially reduced using this system, while the quality of treated water will be superior to the quality of alum-treated water. (Lowry-Texas)
W72-09387

CRYSTAL SEED CONDITIONING OF CALCIUM CARBONATE SLUDGE,
Auburn Univ., Ala.
R. H. Wynne, Jr.
M.Sc. Thesis, August 27, 1971. 68 p, 7 fig, 8 tab, 29 ref. OWRR A-024-ALA (1).

Descriptors: *Water treatment, *Sludge, *Crystal growth, Calcium carbonate, Hardness (Water), Chemical precipitation, Separation techniques, Sedimentation, Filtration, Suspended solids, Mixing, Shear, Laboratory tests, Analytical techniques, Waste water treatment.
Identifiers: *Crystal seed conditioning, *Specific resistance, *Sludge volume index, Filterability, Settleability.

Addition of seed crystals of settled sludge back into raw municipal water prior to treatment, known as crystal seeding, was investigated on a laboratory scale using calcium carbonate sludges. Variables investigated included crystal seed dosage, mixing rate, and number of recycles of the sludge. Effects of the seeding on filterability were evaluated using a Buchner funnel to measure specific resistance, and the effects of seeding on sludge settleability were evaluated in terms of the sludge volume index (SVI). Optimum value for number of recycles of the sludge was established at 3, and any further recycle was of no additional benefit. Optimum specific resistance was obtained at a 50% return sludge dosage, and optimum SVI reduction was obtained at 25%. A 200 rpm mixing rate produced optimum specific resistance in both seeded and unseeded samples, and a 300 rpm mixing rate produced optimum SVI reduction in both samples. All results obtained appeared to follow the accepted theories relating to crystal growth processes. (Lowry-Texas)
W72-09392

FILTRATION OF WATER AND WASTE-WATER,
University Coll., London (England).
For primary bibliographic entry see Field 05D.
W72-09393

THE EFFECT OF CHLOROFORM IN SEWAGE ON THE PRODUCTION OF GAS FROM LABORATORY DIGESTERS,
Middle Lee Regional Drainage Scheme (England).
For primary bibliographic entry see Field 05D.
W72-09398

BIOCHEMICAL PROCESS,
Bacti Products, Inc. (Assignee).
For primary bibliographic entry see Field 05D.
W72-09502

UNDERSTANDING TURBIDITY MEASUREMENT,
Hach Chemical Co., Ames, Iowa.
C. C. Hach.
Industrial Water Engineering, Vol. 9, No. 2, p 18-22, February/March 1972. 9 fig.

Descriptors: *Turbidity, *Instrumentation, Filtration, Coagulation, Filters, Monitoring, Water analysis, *Water treatment.
Identifiers: *Turbidimeters, Standard methods, Formazin, Nephelometers, Absorptometers, Raleigh ratio, Jackson turbidity units, Photoelectric turbidimeters, Formazin turbidity units.

Since satisfactory, low-range turbidimeters became available around 1958, turbidity measurement has become the best available index for dosage control of clarification chemicals in water treatment. The development of turbidimeters and their capabilities and limitations are discussed. The Jackson Turbidimeter, the earliest developed and still in use, has a usable range only above 25 JTU (Jackson Turbidity Units) and does not measure fine particles of suspended matter. This instrument uses a candle flame as a light source. Two types of photoelectric turbidimeters, the nephelometer and the absorptometer, use an incandescent lamp for light and to measure fine particles. The nephelometer is very sensitive for measuring small turbidities, the absorptometer is not. There are two serious problems in turbidity measurement. First is a misunderstanding of the relationship of suspended matter to measured turbidity. Even where a succession of measurements are made on the same turbidimeter, many samples do not exhibit a linear relationship between mg/l suspended matter and FTU (Formazin Turbidity Unit) turbidity. Second, different types of turbidimeters, when standardized on the same turbidity standard, usually give far different readings when used to measure the turbidity of a sample containing another turbidity substance. (Mortland-Battelle)
W72-09671

MECHANISM OF HYDROGEN ION BUFFERING IN NATURAL WATERS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
W. J. Weber, Jr., and W. Stumm.
Journal of the American Water Works Association, Vol. 55, No. 12, p 1553-1578, December 1963. 9 fig, 3 tab, 14 ref.

Descriptors: *Water treatment, *Hydrogen ion concentration, *Natural streams, *Photosynthesis, Coagulation, Erosion, Aeration, Corrosion, Ion exchange.
Identifiers: *Buffer components, Biologic respiration.

Natural and synthetic processes, such as photosynthesis, biologic respiration, aeration, erosion, corrosion, mineral dissolution, ion-exchange, metal ion coagulation, and chlorination affect hydrogen ion concentration in natural water systems. The relative significance of the principal buffer components, and manner in which they act to regulate pH is discussed. Mathematical expressions with which quantitative evaluations of chemical systems can be made have been derived. Conceptual definitions of alkalinity and acidity are presented and their respective roles delineated. (Bean-AWWARF)
W72-09687

PLANT SCALE REACTIVATION AND REUSE OF CARBON IN WASTEWATER RECLAMATION,
Neptune Microfloc, Inc., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W72-09688

THE APPLICATION TO EXISTING PLANT OF RECENT DEVELOPMENTS IN WATER FILTRATION,
Newcastle and Gateshead Water Co., Newcastle-upon-Tyne (England).
A. T. Palin.
Journal of the Institution of Water Engineers, Vol. 20, No. 7, p 472-476, Oct. 1966. 1 tab, 4 ref.

Descriptors: *Water treatment, Sanitary engineering, *Filtration, *Design, Coagulation, *Electrolytes, Turbidity, Treatment facilities, *Filters.
Identifiers: Anthracite-sand filters, Microfloc, Sludge blanket, Filter runs, *Polyelectrolytes.

The application of polyelectrolytes to existing plants, and their use with an anthracite-sand filter are described. While variations between individual plants remain, the general approach to water treatment should be along the following lines: Microfloc alum dosing; Present sedimentation basins serving as reaction chambers for floc development to the micro-stage and no further; higher throughputs; Regular desludging of such basins discontinued; the sludge blanket approach abandoned; Polyelectrolytes applied as filter aids; greatly increased filter rates with gradual conversion from sand to anthracite-sand of the rapid gravity filters; pressure filters to receive further consideration at a later stage. The influence of raw water quality appears to depend largely upon its turbidity. With clear waters a substantial reduction in alum dosing is generally to be expected. More turbid and highly colored waters require treatment at a level nearer the normal coagulating dose when some degree of flocculation and settlement may occur. In extreme conditions it may be desirable to reduce the applied load since filter runs even with anthracite-sand filters could otherwise become impractically short. A reappraisal of the laboratory and works control procedures suggests itself in connection with the new techniques. (Bean-AWWARF)
W72-09689

THE OZONIZATION OF TURRET AND OTHER SCOTTISH WATERS,
Babtie, Shaw and Morton, Glasgow, (Scotland).
R. M. Campbell, and M. B. Pescod.
Journal of the Institution of Water Engineers, Vol. 19, No. 2, p 101-125, March 1965. 13 fig, 3 tab, 16 ref. Discussion p 126-162.

Descriptors: *Water treatment, *Ozone, Disinfection, Color, Taste, Manganese, Organic matter, Turbidity, Surface waters, Economics, Hydrogen ion concentration, *Pilot plants.
Identifiers: *Microstraining.

Results obtained on various waters by applications of microstraining and ozoniation are described. The pilot-planet studies at Loch Turret proved the effectiveness of ozone in reducing color naturally present in a raw upland water, with certain incidental advantages; the combination of microstraining and ozonation proved a practical proposition, not the least on economic grounds. On four other waters it was possible at all times to effect a marked improvement through complete disinfection, taste removal and a substantial reduction in color. Water from one reservoir after a period of stratification could not be suitably treated by the process due to the presence of turbidity and manganese. Treatment with ozone was not economical feasible for one upland water, highly coloured, as was also true of another water with high organic content. Turbidity and/or high iron and manganese in the raw water made the treatment prohibitive, while low pH and high color giving rise to high ozone demand and power costs would be restrictive. (Extended discussion by various authors more than doubles the length of text). (Bean-AWWARF)
W72-09690

USE OF ACID-TREATED SODIUM SILICATE IN COAGULATION,
Chicago Dept. of Water and Sewers, Ill.
J. R. Baylis, and A. E. Mrva.
Journal of the American Water Works Association, Vol. 55, No. 12, p 1536-1552, December 1963. 3 fig, 2 tab, 5 ref.

Descriptors: *Water treatment, *Microorganisms, *Coagulation, Flocculation, Sedimentation, *Silicates, Winter, Illinois.
Identifiers: *Aluminum sulfate, Activated silica, Coagulant aids, Chicago (Ill).

The use of sodium silicate in coagulation, experimental work at Chicago, and the preparation, storage, feeding and control of silicate, are discussed. When the South District plant was constructed 1938-47, silicate treatment was provided. It has been useful in the winter months, because of periods of weak coagulation. In the first few years treatment was needed for periods of 1-3 months or more, generally when the micro-organisms were low in count. In the past few years such organisms have been so abundant in the winter months that there has been little need for silicate. From the start of operation, the plan has been to use silicate only when needed to prevent floc passing filters, and to use only such quantities as were needed to prevent such. Consequently use has been low. The use of silicate decreases the alum requirement, hastens the rate of settling and strengthens the coagulation. (Bean-AWWARF)
W72-09691

DECONTAMINATION OF RADIOACTIVE AQUEOUS EFFLUENT BY THE CALCIUM-FERRIC PHOSPHATE PROCESS,
Australian Atomic Energy Commission, Coogee.
C. R. Frost.
Journal of the American Water Works Association, Vol 55, No. 5, p 581-586, May 1963. 4 tab, 4 ref.

Descriptors: *Water treatment, *Radioactivity, *Sludge, *Calcium, *Phosphates, Hydrogen ion concentration, Lime, *Sludge treatment.
Identifiers: *Ferric chloride, Decontamination, Sludge blanket.

Decontamination of low level radioactive wastes in a sludge blanket clarifier has been accomplished by simultaneous precipitation of calcium and ferric phosphates in the wastes. High concentrations of dosing ions made chemical costs much greater than alternative processes such as precipitation by aluminum hydroxide. Experiments are reported utilizing dosages of ions approximately half those previously used, also runs utilizing the full dosages previously found effective. With the full dosages of PO4, Ca, and Fe3 ions, complete precipitation can be achieved at pH 9.5. Dosing with ion concentrations of approximately half will not appreciably reduce the effectiveness of the process. The calcium and ferric phosphate process can effect a greater than 70% removal of uranyl and strontium ions and mixed fission products, but cesium removal is poor. (Bean-AWWARF)
W72-09692

MEASUREMENT AND CONTROL OF PARTICULATE MATTER IN FILTER EFFLUENTS,
Flint Water Utility, Mich.
R. M. Harwood.
Journal of the American Water Works Association, Vol. 55, No. 4, p 487-489, April 1963. 1 ref.

Descriptors: *Water treatment, *Filtration, *Algae, *Water quality, *Activated carbon, *Electrolytes, Filters, *Analytical techniques.
Identifiers: *Millipore filters.

The search for improved quality puts more and more emphasis on measurment and control. Type AA milipore filters, pore size 0.8 microns with 9.6-sq cm filter area and suction equal to 12 in. mercury column are used, to measure materials in the effluent of filters. The most rapid method for detection and analysis is the simple patch test. The filter cake is mounted and compared with previous samples collected from the same system. The particulate discoloration of the filter is a rough indication of the cleanliness of the sample. For algae count the filter is washed and subjected to microscopic counting, reported in organisms per gallon. The dry filter may be placed on the microscope stage for direct counting of particles by reflected light. Carbon and floc particles can be visually identified. Time of flow through the membrane filter will indicate the filterability. Most of the algae forms in the raw water may appear on the membrane filter, also fines of the activated carbon. Polyelectrolytes may be useful in reducing penetration in the plant filters. (Bean-AWWARF)
W72-09693

RESEARCH ON ALGAL ODOR,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
T. E. Maloney.
Journal of the American Water Work Association, Vol. 55, No. 4, p 481-486, April 1963. 1 fig, 2 tab, 3 ref.

Descriptors: *Water treatment, *Water quality, *Algae, *Odor, Hydrogen ion concentration.

Preliminary studies in research on the role of algae in causing odors in water supplies are presented. Investigations carried out with chlorococcum, a unicellular green alga, in pure culture indicate that the odoriferous material is, for the most part, retained within the cells until their death or disintegration. The odor produced by this alga increased notably under experimental conditions in the acidic pH range. Fractionization of disintegrated algal cells revealed that a number of chemical compounds are involved in the odoriferous material. (Bean-AWWARF)
W72-09694

STOICHIOMETRY OF THE COAGULATION OF COLOR-CAUSING ORGANIC COMPOUNDS WITH FERRIC SULFATE,
Florida Univ., Gainesville. Dept. of Chemistry.
A. P. Black, J. E. Singley, G. P. Whittle, and J. S. Maulding.
Journal of the American Water Works Association, Vol. 55, No. 10, p 1347-1366, Oct. 1963. 16 fig, 4 tab, 22 ref.

Descriptors: *Water treatment, *Color, *Organic matter, *Coagulation, Hydrogen ion concentration, Zeta potential, Iron, Stability, *Sulfates.
Identifiers: Ferric coagulant.

A method has been developed for determination of the optimum conditions for the removal of organic color from relatively soft colored waters with ferric sulfate. The two variables that must be controlled are coagulation pH and ferric sulfate dose, both of which can be predicted with considerable accuracy from the raw-water color. Ferric sulfate is a very effective coagulant for removal of organic color. For each colored water there is a broad specific range of acid pH values and ferric sulfate doses within which most of the color is removed. In contrast to alum, the maximum color removal does not occur at zero mobility. The water must be stabilized at pH greater than 6.0 before filtration for maximum removal of color and iron. (Bean-AWWARF)
W72-09695

STUDIES ON ACTINOMYCETES AND THEIR ODORS,
Cincinnati Univ., Ohio. Dept. of Biological Sciences.
A. H. Ramano, and R. S. Safferman.
Journal of the American Water Works Association, Vol. 55, No. 2, p 169-176, February 1963. 6 tab, 16 ref.

Descriptors: *Water treatment, *Actinomycetes, *Odor, *Activated carbon, *Chloride, Hydrogen ion concentration.

Water and mud samples were employed in insolating actinomycetes from several rivers and lakes. Populations studies indicated relatively few actinomycetes in the water but large numbers in the mud. The Streptomyces isolates produced more intense earthy odors than did the Micromonospora, therefore Streptomyces griseoluteus IM 3718 was chosen for further study. Concentrates of the pure cultures had threshold odor numbers in the billions. Odors typical of these were also demonstrated in soil samples, and the odoriferuus materials were readily washed from the soil. Chemical structures of the oderiferous concentrates are yet unknown. All evidence thus far merely implicates the actinomycetes as a source of earthy odor in water supplies. When concentrates were treated with chlorine, slight decreases in odor intensity occurred. On the other hand 10 ppm of activated carbon was highly efficient in reduction of the odors. The addition of 1 ppm chlorine to spore suspensions of actinomycetes, buffered to pH 7.5, was effective in preventing their development. (Bean-AWWARF)
W72-09696

MYCOBACTERIA OF SEWAGE WATER AND SEDIMENT, (IN FRENCH),
Institut Pasteur, Lille (France). Laboratoire d'-Hydrobiologie.
For primary bibliographic entry see Field 05A.
W72-09777

5G. Water Quality Control

THE ECONOMIST'S APPROACH TO POLLUTION AND ITS CONTROL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Economics.
For primary bibliographic entry see Field 06C.
W72-09145

ECONOMIC INFORMATION FOR ENVIRONMENTAL QUALITY MANAGEMENT,
Consortium of Universities, Washington, D. C. Urban Transportation Center.
For primary bibliographic entry see Field 06G.
W72-09147

ROLE OF THE SOIL CONSERVATION SERVICE IN DESIGN OF FEEDLOT WASTE MANAGEMENT FACILITIES,
Soil Conservation Service, Lincoln, Neb.
D. R. Vallicott.
(1970), 2 p.

Descriptors: *Farm wastes, *Design criteria, Construction costs, Cost sharing, *Standards, Runoff, Government supports.
Identifiers: *Feedlot runoff, *Soil Conservation Service, Runoff control.

The Soil Conservation Service works with farmers and ranchers in the planning and installation of soil and water conservation practices on their farms or ranches and, since feedlot runoff control can be effected by the installation of a system of conservation practices, it comes within the scoope of Soil Conservation Service responsibility. Assistance to the farmer or rancher comes from three sources: the Extension Service, the Soil Conservation Service, and the Agricultural Stabilization and Conservation Service for cost sharing where applicable. The Soil Conservation Service has, based on its knowledge in the design and performance of certain conservation practices, prepared an Engineering Standard and Specification for what has been termed 'Feedlot Runoff Control'. The standard has been prepared using what are considered proven methods and procedures. It is anticipated that improvements will be made as other methods and procedures are proven to be sound. (Dorland-Iowa State)
W72-09149

ALTERNATIVES FOR WASTE MANAGEMENT FOR OPEN BEEF FEEDLOTS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
A. F. Butchbaker, J. E. Garton, G. W. A. Mahoney, M. D. Paine, and A. Wetmore.
Paper number SWR 71-403 presented at 1971 Annual Meeting Southwest Region of the American Society of Agricultural Engineers, Sequoyah State Park, Oklahoma. April 1-2, 1971. 20 p, 3 fig, 1 tab, 16 ref. FWQA Grant 13040 FXG.

Descriptors: *Farm wastes, *Runoff, *Solid wastes, Confinement pens, Disposal, Farm lagoons, *Waste disposal, Cattle, Cost comparisons, *Waste storage, *Design criteria, Feedlots.
Identifiers: *Cattle feedlots, Runoff treatment, Mechanical removal.

During the 1960's, the number of fed cattle marketed in the United States increased from 13 million to 25 million. This increase in fed cattle produced resulted in a corresponding increase in waste production. Daily manure production of a beef animal is about 6% of his body weight. The object was to develop open beef feedlot design criteria to minimize pollution from runoff wastes and to facilitate handling of solid and liquid animal waste and to examine alternative feedlot waste disposal systems to determine minimum cost systems for effective waste disposal. Six systems of waste handling were investigated; tractor loader and dump truck, commercial loader and dump truck, tractor loader and pull spreader, commercial loader and spreader truck, rotary scraper, and an elevating scraper. Several types of runoff control systems were also investigated; solids settling and detention, solids settling and lagoon, detention and lagoon, detention pond only, broad base detention, and batch detention. The characteristics of the solid waste material and the changes it undergoes during storage in a feedlot were also studied. (Dorland-Iowa State)
W72-09150

PHOTOGRAPHIC STUDIES OF THE DUNGING BEHAVIOR OF PIGS IN CONFINEMENT,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
J. P. Hultgren, and T. E. Hazen.
Paper number MC 71-101 presented at the 1971 Mid-Central Meeting of the American Society of Agricultural Engineers, St. Joseph, Missouri, April 16-17, 1971. 15 p, 5 fig, 1 tab, 10 ref.

Descriptors: *Farm wastes, *Animal behavior, *Design criteria, Hogs, Training, Environmental effects, Light intensity, Temperature, Photography, Confinement pens, *Odor.
Identifiers: Dunging behavior, Time-lapse photography, Statistical analysis.

Each year in the United States, an increasingly larger volume of hogs are produced in confinement. Greater and greater emphasis is being placed on the control of offensive odors. Pen and pig cleanliness are important in odor control. Both are largely dependent on defecation behavior and feces placement. A research project was initiated to determine if pigs had a predictable defecation pattern and what housing design factors might influence this behavior. Time-lapse photographic observations on 180 pigs indicated that they spend an average of 81.1 percent of each 24-hour period sleeping, 7.6 percent standing, 10.0 percent eating, 0.9 percent drinking, and 0.4 percent defecating. Tested for effect on the dunging behavior were 3 levels each of air temperature and lighting, and 3 locations of air placement. When statistically analyzed, the treatment differences were seldom significant. The pigs developed some established activity patterns, however, which provide a basis for improved building design and sanitation. (Dorland-Iowa State)
W72-09153

THE NATION'S RIVERS,
Johns Hopkins Univ., Baltimore, Md.
M. G. Wolman.
Science, Vol 174, No 4012, p 905-918, Nov 1971. 9 fig, 7 tab, 68 ref.

Descriptors: *Water pollution, *Water quality, *Rivers, Bibliographies, Hydrologic data, Dissolved oxygen, Pesticides, Biochemical oxygen demand, Dissolved solids, Sediments, Temperature, Radioactivity, Sewage treatment, Pollution abatement.
Identifiers: Environmental quality.

Problems are encountered in appraising trends in water and river quality. Water pollution is often defined subjectively as any impairment of water for beneficial purposes, or any change objectionable to the public, or any deterioration of water quality. Such definitions describe public attitudes toward environmental quality, and provide incentives for public action. Evaluating alternative ways of combating observed water and river deterioration requires objective measurements to describe the conditions and relate them to technological measures appropriate to water resources management. Few studies of quality of the Nation's rivers have been directed toward determining changes in specific parameters over long periods. Statistics are inadequate because: U S hydrologic records are short; analysis techniques have changed over the years; changes in location or frequency of water quality observations may distort records; correlations of water and river quality with hydrologic behavior are not available; knowledge of natural background is essential in detecting and measuring trends; and explanation of water quality changes requires knowledge of the economy and land use of the area. (USBR)
W72-09188

AERATION SYSTEMS FOR LARGE NAVIGABLE RIVERS,
Rutgers - The State Univ., New Brunswick, N.J.
W. Whipple, Jr., and S. L. Yu.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 97, No SA6, p 883-902, Dec 1971. 13 fig, 4 tab, 17 ref, 2 append.

Descriptors: *Aeration, *Rivers, Water pollution, On-site tests, Dissolved oxygen, *Navigable rivers, *Water treatment, Mechanical equipment, Sewage treatment plants, Waste water treatment, Sanitary engineering, Bibliographies, Estuaries, Costs, Dispersion, Evaluation, Waste water, Sanitation, Diffusion.
Identifiers: *Oxygenation, Delaware estuary, Delaware River Basin, Delaware River.

River aeration systems, using slight modifications of commercially available components, offer an economical means of achieving dissolved oxygen standards on major rivers. Whether surface aerators or bottom air diffusers are applicable to a given site depends primarily upon requirements of navigation. Spacing of aerator sites would require an analysis of dispersion characteristics and biochemical-oxygen-demand regimen. On critical areas of the Delaware estuary, estimated costs of obtaining the last milligram per liter of dissolved oxygen by river aeration are less than one-third of the costs of obtaining the same objective through waste treatment only. Lower costs may result from using pure oxygen dispersers, but this possibility apparently has not been fully explored. Considerable institutional barriers must be overcome prior to changing from a system of treatment only to a system of treatment supplemented by in-stream aeration. (USBR)
W72-09196

USE OF GENERAL EQUILIBRIUM IN REGIONAL WATER RESOURCE PLANNING.
Georgetown Univ., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-09228

SYSTEMS ANALYSIS FOR WATER QUALITY MANAGEMENT - SURVEY AND ABSTRACTS.
Enviro Control, Inc., Washington, D.C.

Copy available from GPO Sup Doc, $1.75; microfiche from NTIS as PB-209 894, $0.95. Environmental Protection Agency, Water Quality Office, September, 1971. 92 ref. EPA Program SO1 09/71.

Descriptors: *Systems analysis, *Water quality, *Water management (Applied), *Model studies, Legal aspects, Social aspects, Economics, Effects, Evaluation, Physical properties, Chemical properties, Biological properties.

Due to the increasing scale of national efforts to clean up our streams, rivers and lakes, a survey of the current state-of-the-art in systems analysis for water quality management has been conducted. The survey is geared primarily towards helping to acquaint non-specialists with the prevailing methods, capabilities, and limitations of the analytical approach, in light of continuous rapid growth of systems analysis techniques in water quality management; physical, chemical and biological considerations in water quality modeling; and legal, social demographic, and economic aspects of water quality. Part II presents a group of relatively detailed abstracts of a representative sampling of papers in relevant analytical input areas and in the major water quality modeling areas. It is concluded that systems analysis should be simply a practical, rational and quantitative approach to illuminating, but not necessarily solving, decision issues that involve costs and benefits. (Bell-Cornell)
W72-09229

MONITORING THE ENVIRONMENT OF THE NATION,
MITRE Corp., McLean, Va.
For primary bibliographic entry see Field 06G.
W72-09230

POLLUTION PRICES IN A GENERAL EQUILIBRIUM MODEL,
California Univ., San Diego, La Jolla. Dept. of Economics.
L. E. Ruff.
Available from the National Technical Information Service as COM-721 10118, $3.00 in paper copy, $0.95 in microfiche. Institute of Marine Resources Ref. No 72-3, Sea Grant Publication No. 12, May 1970. 25 p, 2 fig, 10 ref. OSG-GH52.

Descriptors: *Pollution, *Pollutants, *Water pollution, *Decision making, *Political aspects, *Smog, Mathematical models, Air pollution, Systems analysis.
Identifiers: *Pollution prices, *Environmental pollution, *Economic analysis, Los Angeles.

Many pressing pollution problems can be solved efficiently using traditional economic analysis. It is argued that benefit-cost analysis and direct regulation are totally inadequate tools for the more complex pollution problems. A political-economic process is proposed and outlined. Ultimately, institutions must be designed which will allow explicit political decisions where required, allow economic calculation where possible, and provide sufficient feedback between the economic and political mechanisms so that the system is responsive, stable, and efficient. A simple extension of standard general equilibrium models is used to analyze general equilibrium with pollution prices. A price system may be able to reduce pollution efficiently with a minimum of information and interference, and provide estimates of costs of further reduction, allowing political decisions about desired pollution levels to be made simply and rationally. (Bell-Cornell)
W72-09235

PHOTOCHEMISTRY OF BIOACTIVE COMPOUNDS. SOLUTION-PHASE PHOTOCHEMISTRY OF ASYMMETRIC TRIAZIN-5 (4H)-ONES,
Michigan State Univ., East Lansing. Dept. of Entomology.
For primary bibliographic entry see Field 05B.
W72-09250

DYNAMICS OF CONTAINED OIL SLICKS,
National Research Council of Canada, Ottawa (Ontario). Hydraulics Section.
D. L. Wilkinson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY6, Paper 8950, p 1013-1030, June 1972. 9 fig, 2 tab, 7 ref, append.

Descriptors: Oily water, *Oil spills, *Path of pollutants, *Water pollution treatment, Rivers, Viscosity, Turbulence, Sea water, Stratified flow, Oil-water interfaces, Hydraulic models, Hydrodynamics, *Oil wastes.
Identifiers: *Oil spill containment.

An oil slick contained on the surface of a flowing stream may be divided into two zones of influence; a frontal region where dynamic forces are dominant and a viscous zone where viscous stresses determine the form of the slick. The frontal thickness of an oil slick can be expressed as a function of a densimetric Froude number based on properties of the stream and the density of the oil. Dynamic effects cause the interface to become unstable when the densimetric Froude number exceeds a critical value and retention of a slick under such conditions becomes impossible. (Knapp-USGS)
W72-09258

ALGAE CONTROL BY MIXING, STAFF REPORT ON KEZAR LAKE IN SUTTON, N.H.
New Hampshire Water Supply and Pollution Control Commission, Concord.

Report to the New England Regional Commission, April 1971. 103 p, 28 fig, 30 tab, 76 ref.

Descriptors: *Algal control, *Eutrophication, *Destratification, *Water quality control, *Lake morphology, Aeration, Mixing, Algal blooms, Algal toxins, Water circulation, Water pollution control, Fishkill, New Hampshire, Water pollution effects, Copper sulfate.
Identifiers: *Kezar Lake, Air injection, Compressed air.

The control of algae in Kezar Lake by destratification was demonstrated in field experimental work conducted in 1968 and 1969. Kezar Lake has suffered from increasingly virulent blooms of algae which apparently have been induced by nutrients

contained in wastewater reaching the lake. A growing number of New England lakes shares this problem, which threatens one of the region's major recreational resources. Beyond the eutrophication of the lakes themselves, the results can be measured in declining property values and decreases in recreation business which are directly attributable to the unaesthetic appearance of an algae-choked lake. The New Hampshire Water Supply and Pollution Control Commission appears to have developed an effective and inexpensive method of bringing such algal blooms under control by mixing the water in the lake and allowing natural processes to take over. Homogenizing, mixing or destratifying Kezar Lake was accomplished by forcing compressed air, from shore-located compressors, through P.V.C., 2-inch-diameter piping to the deepest portion of the lake where it was released through ceramic diffusers, and allowed to bubble up to the lake surface through the water column. Clarity of the water was visibly and measureably improved; the populations of noxious algae, so objectionable to recreation interests, were decreased in number; and no harmful effects were detected during 1968 and 1969 summer mixing of Kezar Lake. Operating pressures for the compressors are low. The equipment is convenient for necessary maintenance, and the operating and study budget is modest. (Poertner)
W72-09304

CONTROLLED EUTROPHICATION-INCREASING FOOD PRODUCTION FROM THE SEA BY RECYCLING HUMAN WASTES,
Woods Hole Oceanographic Institution, Mass.
J. H. Ryther, W. M. Dunstan, K. R. Tenore, and J. E. Huguenin.
BioScience, Vol. 22, No. 3, p 144-152, March 1972. 4 fig, 11 ref.

Descriptors: *Eutrophication, *Recycling, Water quality control, Sewage treatment, Sewage effluents, Sanitary engineering, Secondary treatment, Marine algae, Phytoplankton, Biomass, Growth rates, Productivity, Animal growth, Plant growth, Oysters, Shellfish, Mussels, Shellfish farming, Aquaculture, Commercial shellfish, Biological communities, Foodchains, Habitats, Niches, Turnovers, Cultures, Waste water treatment, *Cycling nutrients, Nitrogen, Carbon dioxide, Chlorella, Nutrients, Tertiary treatment, Flow rates, Water pollution effects, Primary productivity.
Identifiers: Growth kinetics, Bioenergetics, Enrichment, Culture media, Macroinvertebrates.

The essential feature of 'controlled eutrophication' is the physical separation and compartmentalization of the producer and consumer levels of a biological community. Following these guidelines, laboratory experiments were begun in the summer of 1970 on the growth kinetics of marine plankton algae grown in seawater enriched with effluent from a secondary sewage treatment plant. In general, diluted sewage was found to be an excellent culture medium for the marine phytoplankton. At concentrations of 10 percent sewage, the yield of algae increased with flow rate through the system up to a 'turnover rate' of 50 percent of the culture per day. These algae were subsequently fed to monitored oyster cultures, thus completing the producer-consumer food chain. In one such experiment, a natural population of diatoms grown on 10 percent sewage was passed through a 3m x 1.5m x .5 in. tank containing suspended strings of oyster spat attached to scallop shells. Over 30 days, at 7-10C, the oysters removed 77 percent of the algae and converted 22 percent of the cells into new oyster flesh. These and similar experiments have provided basic data on the kinetics and bioenergetics of a small scale 'controlled eutrophication program' and revealed the value for developing applications in advanced sewage treatment and commercial aquaculture. (Mackan-Battelle)
W72-09378

THE TEMPORARY ABATEMENT OF NUISANCE SPECIES OF TRICHOPTERA WITH DDD (TDE) LARVICIDE,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
For primary bibliographic entry see Field 05C.
W72-09412

PLAN FOR THE MANAGEMENT OF AEC-GENERATED RADIOACTIVE WASTES,
Division of Waste Management and Transportation (AEC), Washington, D.C.
F. K. Pittman.
Available from Supt. of Documents, U.S. Gov. Print. Office, Wash. D.C.-$0.50. Report No. WASH-1202, Jan. 1972, 40 p, 2 fig, 3 tab, 3 append.

Descriptors: *Nuclear powerplants, *Effluents, *Radioactive wastes, *Water pollution, *Water pollution sources, Waste treatment, Waste disposal, Public health, Environment, Ecology, Benefits, Safety factors.
Identifiers: Radiation safety, Radiation control, Public relations, Population response.

The AEC's plans are presented for controlling the controlling the releases of radioactivity and ensuring the safe storage of radioactive wastes generated by past, present and future operations of the AEC. The basic and fundamental objective of this Plan is to handle these wastes at all times in a manner: (1) that will not endanger the health and safety of its employees or the public; (2) that will not have an adverse impact on man's environment or on the ecology; and (3) that will be accepted by the public. Policies and Criteria are given for the various types and energy levels of radioactive wastes. (Houser-ORNL)
W72-09424

PUBLIC SAFETY AND UNDERGROUND NUCLEAR DETONATIONS,
S. Glasstone.
Available from NTIS as TID-25708; $3.00 paper-copy, $0.95 microfiche. Report TID-25708, June 1971, 276p.

Descriptors: *Nuclear explosions, *Canal construction, *Excavation, *Nuclear engineering, *Seismic waves, Underground, Hazards, Air pollution, Water pollution, Water pollution sources, Radioactivity, Soil contamination, Public health, Safety, Water wave, Wave action, Ecology, Meteorology, Conveyance structures, Panama Canal, Geology, Hydrology.
Identifiers: Plowshare program.

The USAEC comprehensive safety programs for protecting the public from the effects of underground nuclear explosions, particularly tests in the Plowshare Project, are described and explained. Information is presented on: current status of Plowshare tests; potential hazards in nuclear detonations; basic principles of nuclear explosions; phenomena associated with underground explosions; the importance of geologic and hydrologic studies of test sites in assuring that water supplies will not be contaminated by underground nuclear explosions; ground motion effects and the response of structures; and seismic effects and water wave phenomena. (Houser-ORNL)
W72-09427

INTEROCEANIC CANAL STUDIES, 1970.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09430

THE EFFECT OF CHANNELIZATION ON THE ENVIRONMENT.
Congress, Washington, D.C.; and Committee on Public Works (U. S. Senate).
Hearing Before the Subcomm. on Flood Control--Rivers and Harbors, Senate Comm. on Public Works, 92nd Cong, 1st Sess, July 27, 1971. 442 p, 1 fig, 5 plate, 10 photo, 13 tab.

Descriptors: *Channel improvement, *Channeling, *Environmental effects, *Environmental control, Channel erosion, Channel flow, Channel morphology, Channels, Flood control, Stream improvement, Drainage engineering, Flood routing, Ecology, Soil erosion, Regulated flow, Flood protection, Engineering, Federal government, Legislation.

The purpose of stream channelization is the reduction and elimination of damage caused by flooding and erosion in our Nation's watersheds. This goal is offset, however, by increased public concern for the preservation of the existing natural environment. This hearing was designed to receive testimony from interested persons regarding the environmental impact of channel improvement projects. The list of witnesses included representatives of the Corps of Engineers, Soil Conservation Service, National Wildlife Federation, National Audubon Society, the Sierra Club, and others. The record includes memoranda establishing guidelines for coordinating interagency planning and review of fish and wildlife resources, examples of benefits resulting from installed works of improvement in watershed projects throughout the United States, and other data supporting the testimony given. No conclusions were reached. (Widman-Florida)
W72-09459

PRESIDENT'S MESSAGE--ENVIRONMENTAL PROTECTION,
For primary bibliographic entry see Field 06E.
W72-09460

POLLUTION: CLEANING UP COSTS MONEY,
P. Gaskell.
Atlantic Community Quarterly, Vol. 10, p 84-93, 1972.

Descriptors: *Economics, *Europe, *Industrial wastes, *Pollution taxes (Charges), *Foreign countries, Environmental control, Industries, Industrial plants, Economics, Costs, Cost sharing, Joint cases, Depreciations, Economic feasibility, Foreign trade, Prices, Competition, Legal aspects, Pollutants, Municipal wastes, Penalties (Legal), Governments, Technology, Water pollution control, Pollution abatement.
Identifiers: *England.

Governmental and industrial efforts to deal with pollution in England and Western Europe are examined. Industry is beginning to feel the pressure of public opinion to help clean up the environment, and executives assert that they are responding. However, municipalities and individuals also pollute and must be curbed. Industry spends close to 10% of the cost of a new plant on pollution control equipment. In Europe where international trade is common, industries in nations with less stringent pollution controls are able to reduce costs and thus outsell nations with higher environmental standards. Although international solutions would be an ideal method of resolving this problem, international organizations are still only studying it. Governments must respond now to domestic pressures, rather than wait for international action. Whether pollution control costs should be paid through taxes on polluters or incentives for clean industries is currently being debated. Germany has imposed stiff penalties on its water polluters. However, critics of taxing effluents say this will not encourage industry to develop cleaner processes. Whatever action is taken, the environmental policies of governments will be doomed without industrial cooperation. (Ilkson-Florida)
W72-09461

DEQUEEN LAKE, ROLLING FORK RIVER, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 08D.
W72-09462

LAGOON POND NAVIGATION PROJECT, MARTHA'S VINEYARD, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-09463

RIGHTS AND RESPONSIBILITIES OF ARCTIC COASTAL STATES: THE CANADIAN VIEW,
Department of External Affairs, Ottawa (Ontario).
For primary bibliographic entry see Field 06E.
W72-09465

GYPSY MOTH SUPPRESSION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.

Available from the National Technical Information Service as PB-198 993F, $3.00 in paper copy, $0.95 in microfiche. May 13, 1971. 52 p, 1 append.

Descriptors: *Pennsylvania, *Insect control, *Environmental effects, *Insecticides, *Pesticide toxicity, Insects, Integrated control measures, Forest management, Conservation, Vegetation regrowth, Natural resources, Chemical analysis, Biocontrol, Biodegradation, Aquatic habitats, Wildlife habitats, Runoff, Storm runoff, Water pollution sources, Pesticide drift, Pesticide residues.
Identifiers: *Environmental Impact Statements, *Gypsy moth.

The proposed project involves spraying 20,000 acres of land in Pennsylvania with carbaryl to protect valuable resources from imminent damage from the gypsy moth. Only those areas which are heavily infested will be treated. The toxic effect of carbaryl on the aquatic environment, water supplies, aquatic life, marine organisms, people, insects, birds and small mammals, soil, and food is considered. The mechanics and timing of the spraying operation are discussed. Adverse environmental effects include the following: (1) the probability that spray deposits will enter non-target areas through openings in the forest canopy and water runoff; (2) loss of certain non-target insects; (3) damage to crustaceans and mollusks; (4) temporary food chain contamination, since carbaryl rapidly decomposes and biodegrades; and (5) an upset in the normality of the biomass for seven to eight weeks. Alternatives include other insecticides, biological control, site manipulation, and no action. The project will result in no foreseeable cumulative long term adverse effects and no irreversible commitments of resources. (Grant-Florida)
W72-09466

INTERNATIONAL AND NATIONAL APPROACHES TO OIL POLLUTION RESPONSIBILITY: AN EMERGING REGIME FOR A GLOBAL PROBLEM,
P. N. Swan.
Oregon Law Review, Vol. 50, p 504-586, Spring 1971. 484 ref.

Descriptors: *Oil pollution, *International law, *International waters, *Oil spills, *Remedies, Law of the sea, Foreign trade, Oil industry, Oil wastes, Navigation, Transportation, International commissions, Legal aspects, Governments, Governmental interrelations, Treaties, Foreign waters, Oily water, Water pollution sources, Foreign countries, Integrated control measures, Law enforcement.

Under the auspices of the Inter-governmental Consultative Organization (IMCO) two treaties were prepared in 1969 to deal with ocean pollution. These conventions, recent national legislation, and industry compensation plans are examined. The 1969 IMCO Conventions are the Civil Liability Convention, concerning seagoing vessels carrying oil as cargo, and the Public Law Convention, concerning the right of a coastal state threatened with pollution damage to take action on the high seas. National legislation examined includes pending congressional bills and the Water Quality Improvement Act of 1970 in the United States, the Canadian Arctic Waters Pollution Prevention Act, and Norwegian and British legislation. Private oil industry agreements for oil cleanup expense are discussed, as well as proposals for an international Environmental Agency which would oversee all international pollution problems, including seabed exploitation and oil pollution of the ocean. Exactly how financial burdens will be allocated between shipowners and the oil industry may be settled by the establishment of the IMCO Supplemental Fund. Attention can then be turned to the more basic question of how to prevent or minimize pollution incidents as part of an overall program of environmental protection. (Blank-Florida)
W72-09467

COOK INDUSTRIES V. CARLSON (RIGHT OF SUMMARY ABATEMENT OF PRIVATE NUISANCE).
For primary bibliographic entry see Field 06E.
W72-09471

U.S. OPPOSES UNILATERAL EXTENSION BY CANADA OF HIGH SEAS JURISDICTION.
Department of State, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-09472

A STATUTORY ANALYSIS OF FLORIDA'S WATER POLLUTION CONTROL LEGISLATION,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 06E.
W72-09479

HUDSON RIVER CHANNEL, NEW YORK--OPERATION AND MAINTENANCE ACTION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-09483

PRESIDENT NIXON ASKS SENATE APPROVAL OF CONVENTIONS ON POLLUTION OF THE SEA BY OIL,
For primary bibliographic entry see Field 06E.
W72-09485

OFFSHORE OIL POLLUTION (MESSAGE FROM PRESIDENT NIXON TO CONGRESS),
For primary bibliographic entry see Field 06E.
W72-09486

PROCESS FOR CLEANING UP OIL SPILLS,
Avco Corp., Cincinnati, Ohio. (Assignee).
R. Kaiser.
U. S. Patent No. 3,635,819, 9 p, 6 tab, 7 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 3, p 1094, January 18, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Pollution abatement, Water pollution, Water pollution treatment, Separation techniques.
Identifiers: *Ferrofluids.

The process involves dispersing a hydrocarbon base ferrofluid containing an oil soluble water insoluble surfactant and a stable colloid of magnetic solids, e.g. magnetite in oil slick. A magnetic field is then used to attract and pick up the oil spill. Experimental test data are tabulated. (Sinha-OEIS)
W72-09490

APPARATUS FOR CONTROLLING THE DISPERSION OF POLLUTANTS FLOATING ON A BODY OF WATER,
E. J. Rupnick.
U. S. Patent No. 3,635,347, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 3, p 982, January 18, 1972.

Descriptors: *Patents, *Oil pollution, *Flotsam, Pollution abatement, Specific gravity, Water pollution, Water pollution treatment, Equipment, Separation techniques.

Pollutants floating on a water surface are directed into an enclosed reservoir by means of a conduit secured at one end around the source and at the other end to the interior of the reservoir. The reservoir wall consists of an elongated length of flexible water-impervious material. The ends of the reservoir wall are joined together by engaging inflated cells disposed along the ends of the wall. (Sinha-OEIS)
W72-09494

BOOM FOR OIL SPILT ON WATER,
British Petroleum Co. Ltd., London (England). (Assignee).
D. H. Desty, L. Bretherick, and M. G. Webb.
U. S. Patent No. 3,635,032, 3 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 894, No. 3, p 901, January 18, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Separation techniques, Pollution abatement, Water pollution, Water pollution treatment.

A boom consists of two barriers for impeding the passage of spilt oil, and two drogues for holding the barriers stationary creating a high resistance to motion through the water. A V-shaped configuration is adopted. The oil driven by the wind enters the mouth of the V and is accumulated at the apex. Inflatable booms are particularly suitable for the confinement of oil spills. (Sinha-OEIS)
W72-09495

POLLUTED WATER: A CHALLENGE TO FORENSIC BIOLOGY,
Colorado State Univ., Fort Collins. Dept. of Zoology.
C. G. Wilber.
Journal of Forensic Sciences. Vol 16, No 3, p 251-268. 1971. Illus.
Identifiers: *Forensic biology, Mercury, Pathology, Radioactivity, Water pollution sources, Water pollution effects, *Water pollution.

Problems associated with pollution of the aquatic environment are discussed: Hg pollution, radioactivity, pesticides, and experimental pathology.--Copyright 1972, Biological Abstracts, Inc.
W72-09498

METHOD OF AND APPARATUS FOR SKIMMING FLOTSAM FROM THE SURFACE OF A BODY OF WATER,
Reynolds International, Inc., Richmond, Va. (Assignee).
A. L. Markel.
U. S. Patent No. 3,637,080, 3 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 894, No 4, p 1384, January 25, 1972.

Descriptors: *Patents, *Flotsam, Skimming, *Oil spills, *Oil pollution, Pollution abatement, Water pollution, Water pollution treatment, Separation techniques, Equipment, Harvesting.

Floating material, such as oil is directed toward and into pockets of a continuously driven conveyor belt which serves to submerge the floating material beneath the water surface. The material is transferred to a conduit from which it is pumped to station where it is separated from the water. If the skimmer is to be used as a harvester, a cutting device is placed at the entrance of the conduit to shred the plants. (Sinha-OEIS)
W72-09499

OIL SLICK ELIMINATION,
Dresser Industries, Inc., Houston, Tex. (Assignee).
W. B. Patterson, Jr.
U. S. Patent No. 3,634,227, 2 p, 5 ref; Official Gazette of the United States Patent Office, Vol 894, No 2, p 719, January 11, 1972.

Descriptors: *Patents, *Oil pollution, *Oil spills, Pollution abatement, Water pollution, Water pollution treatment, Clays, *Emulsifiers, Separation techniques.

An absorbent clay is spread over the oil slick to absorb the oil. The oil bearing clay may then be removed from the surface of the water. If necessary an emulsifier can be used to allow the clay to sink to the bottom of the body of water. (Sinha-OEIS)
W72-09501

APPARATUS FOR REOXYGENATING A BODY OF WATER,
Sanders Associates, Inc., Nashua, N.H. (Assignee).
J. F. Holmes, and D. P. Foudriat.
U. S. Patent No. 3,633,884, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 894, No 2, p 646, January 11, 1972.

Descriptors: *Patents, Lakes, Eutrophication, *Oxygenation, Heat transfer, Equipment, Water quality, Limnology.
Identifiers: *Liquid oxygen.

A submerged cryogenic container of liquid oxygen coupled to a permeable membrane diffusion chamber is provided for diffusing oxygen in its molecular form into the water. Heat transfer from the water to the oxygen container is sufficient to vaporize the liquid oxygen at a predetermined rate. When empty of liquid oxygen the container is positively buoyant and rises to the surface. (Sinha-OEIS)
W72-09503

APPARATUS TO CONFINE AND RECOVER OIL SPILLAGE AT SEA,
P. Fisch.
U. S. Patent No. 3,631,679, 4 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 894, No 1, p 107, January 4, 1972.

Descriptors: *Patents, *Pil spills, *Oil pollution, Equipment, Pollution abatement, Separation techniques, Water pollution, Water pollution treatment.

The floating barrier consists of a flexible pull cable, and a flattened tubular inflatable hose wrapped in flattened condition around the cable. It can be looped to surround a large area covered with oil. A thin oil film on the water surface when confined will gain height so that it can be pumped out. This barrier can be reeled onto a ship and stored until needed. (Sinha-OEIS)
W72-09507

FLOATING OIL CONTAINMENT APPARATUS,
Air Preheater Co., Inc., Wellsville, N.Y. (Assignee).
L. Bakker.
U. S. Patent No. 3,528,665, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 893, No 3, p 936-937, December 21, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution, Water pollution treatment, Pollution abatement, Equipment, Separation techniques.

The device consists of an annular boom floating on the surface of the water. It is placed so as to surround a continuing source of polluting oil. The contained oil is directed into tanks that have an oil-water separation device. The separated oil is stored for subsequent removal. (Sinha-OEIS)
W72-09508

SEPARATOR FOR NONMISCIBLE LIQUIDS,
Rotterdams Havenreinigingen Transport (Netherlands).
C. I. Veld.
U. S. Patent No. 3,628,660, 4 p, 1 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 893, No 3, p 935, December 21, 1971.

Descriptors: *Patents, *Separation techniques, *Oil pollution, Water pollution, Water pollution treatment, Pollution abatement, Equipment, *Liquid wastes, Specific gravity.

The separator consists of a tank, a bell floating in the tank, a feed conduit for the unseparated liquids that has an outlet in the bell, and a discharge conduit. Liquids of different specific gravities are separated. A pressure system is responsible for the discharging process. The lighter liquid is discharged from the outlet at the top of the floating bell, the heavier from an outlet at the bottom of the bell. (Sinha-OEIS)
W72-09509

OIL SPILL REMOVAL METHOD,
Shell Oil Co., New York. (Assignee).
D. N. Dietz.
U. S. Patent No. 3,628,607, 3 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 893, No 3, p 922, December 21, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Separation techniques, Pollution abatement, Water pollution, Water pollution treatment, *Ground water, Aquifers, Potable water, Subsurface waters, Aquifer management.

A method is provided for recovering taste-spoiling components of a hydrocarbon liquid that have percolated into a subsurface drinking water aquifer. This is accomplished by supplying liquid such as water or a tasteless oil to the spill area and recovering the liquid together with the undesired components by means of an auxiliary well. (Sinha-OEIS)
W72-09510

FLOATING CONTAMINANT CONSTRAINING FENCE,
E. W. Newton.
U. S. Patent No. 3,628,333, 9 p, 25 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 893, No 3, p 853, December 21, 1971.

Descriptors: *Patents, Pollution, *Oil pollution, Water pollution, Water pollution treatment, Pollution abatement, Barriers, Equipment, *Oil spills, Flotsam.

A method of placing in position a contaminant constraining floating fence (barrier) structure is provided. The fence or barrier is laid out in an elliptical configuration with its major axis paralleling the predominant water current direction. A settling tank vessel is coupled to a portion of the structure to receive floating contaminants. (Sinha-OEIS)
W72-09512

PUBLIC REGULATION OF WATER QUALITY IN THE UNITED STATES,
Iowa Univ., Iowa City. Coll. of Law.
N. W. Hines.
Available from the National Technical Information Service as PB-208 309, $12.50 in paper copy, $0.95 in microfiche. National Water Commission Report NWC-L-72-036, Dec. 1971, 674 p. Legal Study 18.

Descriptors: *Water pollution, *Water pollution control, *Water Quality Act, *Legal aspects, Institutional constraints, Water quality standards.
Identifiers: *Public regulation, *Regional institutions, *Interstate arrangements.

This legal study explores public regulation of water quality in the United States. It discusses the need for public regulation, the inadequacies of private remedies, local and state governmental efforts, interstate arrangements, the current federal program, and major legislative proposals pending in Congress. The study argues that the 1965 Federal Water Quality Act, which established a program of setting water quality standards through a local, state and federal partnership, is a sound approach to improving water quality, and that current proposals to adopt a national goal of eliminating all discharges to water would imperil rather than enhance the nation's efforts for water quality improvement. (NWC)
W72-09527

ENVIRONMENTAL EVALUATION SYSTEM FOR WATER RESOURCE PLANNING,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 06G.
W72-09560

MIGRATION AND LEACHING OF METALS FROM OLD MINE TAILINGS DEPOSITS,
Idaho Univ., Moscow. Coll. of Mines.
For primary bibliographic entry see Field 05B.
W72-09620

PROBLEMS IN WATER TOXICOLOGY (VOPROSY VODNOY TOKSIKOLOGII).
For primary bibliographic entry see Field 05C.
W72-09646

WATER POLLUTION AND PROBLEMS IN WATER TOXICOLOGY (ZAGRYAZNENIYE VOD I ZADACHI VODNOY TOKSIKOLOGII),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05C.
W72-09647

PRESENT STATE AND DEVELOPMENT OF SCIENTIFIC RESEARCH ON PREVENTION OF FISHERY POLLUTION (SOSTOYANIYE I PERSPEKTIVY NAUCHNO-ISSLEDOVATEL'SKIKH RABOT PO PROBLEME OKHRANY RYBOKHOZYAYSTVENNYKH VODOYEMOV OT ZAGRYAZNENIYA),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
For primary bibliographic entry see Field 05C.
W72-09648

PROBLEM OF PESTICIDES IN WATER TOXICOLOGY (PROBLEMA PESTITSIDOV V VODNOY TOKSIKOLOGII),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 05C.
W72-09650

EFFECTS OF PESTICIDES ON THE LIFE OF A WATER BODY (K VOPROSU O VLIYANII PESTITSIDOV NA ZHIZN' VODOYEMA),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 05C.
W72-09651

PROCEEDINGS - WORKSHOP ON SEDIMENT CONTROL.
For primary bibliographic entry see Field 04D.
W72-09656

WATER QUALITY CONTROL IN OREGON.
Oregon State Dept. of Environmental Quality, Portland.

(1917), 18 p, 12 fig, 7 tab.

Descriptors: *Oregon, *Water quality control, *Water quality standards, *Water law, *Sewage, *Industrial wastes, *Monitoring, Water quality, Dissolved oxygen, Rivers, Biochemical oxygen demand, Sewage treatment, Columbia River, Pacific Ocean, Sampling, Water pollution, Bacteria, Lumbering, Nuclear powerplants, Thermal pollution, Cooling water, Pulp and paper industry, Pulp wastes, Water temperature, Coliforms, Sulfates, Nitrogen, Phosphorus, Chlorides, Water properties, Hardness, Alkalinity, Nutrients.
Identifiers: Willamette River, Glue wastes, Tualatin River, Most probable number, Perle Benson Index, Klamath River.

A synoptic review is given of water quality control in Oregon, including the governing laws. Areas of interest are (1) industrial waste control, (2) water quality surveillance, and (3) the status of water quality in Oregon. No analytical methods are given. (Jefferis-Battelle)
W72-09669

MECHANISM OF HYDROGEN ION BUFFERING IN NATURAL WATERS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05F.
W72-09687

THE OZONIZATION OF TURRET AND OTHER SCOTTISH WATERS,
Babtie, Shaw and Morton, Glasgow, (Scotland).
For primary bibliographic entry see Field 05F.
W72-09690

POLYMER FORMULATIONS OF DURSBAN AND ABATE AS MOSQUITO LARVICIDES, APRIL - OCTOBER, 1970,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05B.
W72-09720

COMPARISON OF EVAPORATIVE LOSSES IN VARIOUS CONDENSER COOLING WATER SYSTEMS,
Westinghouse Electric Corp., East Pittsburgh, Pa.
For primary bibliographic entry see Field 02D.
W72-09735

URBAN PUBLIC POLICY AND POLITICAL INSTITUTIONS FOR WATER-QUALITY MANAGEMENT ON LAKE ERIE: YEAR ONE,
Battelle Columbus Labs., Ohio.
R. M. Davis, D. L. Hessel, and G. S. Stacey.
Available from the National Technical Information Service as PB210-132, $3.00 in paper copy, $0.95 in microfiche. Final Completion Report, April 28, 1972, 75p, 2 fig, 6 tab, 2 append. OWRR C-2083 (No. 3396) (1).

Descriptors: *Political aspects, *Water quality control, *Lake Erie, Administrative agencies, Governments, Legal aspects, Ohio, *Institutions, *Public rights, *City planning, *Water policy, Management, Administration, Institutional constraints.
Identifiers: Cleveland (Ohio), Toledo (Ohio), *Public choice theory.

The management of water quality for Lake Erie looms as a major challenge to society, particularly to government at all levels, if the lake is to survive and recover from severe pollution and eutrophication. Most experts agree that one major barrier to achieving efficient water-quality management is that of inadequate public policies and political institutions. There is a theoretical basis for the way institutions behave toward a common-pool resource. This theory is characterized by the Lake Erie water-quality management situation. Battelle-Columbus used this theoretical basis as a foundation of a 3-year interdisciplinary research program on 'Urban Public Policy and Political Institutions for Water-Quality Management in Lake Erie'. During the first-year program the 'public choice' theory was refined and basic information on water-quality issues in Cleveland and Toledo were collected and analyzed to determine the relevance of this theory to common-pool resource management problems in large urban areas. The preliminary findings derived from this project suggest that the public-choice theory has potential application to the analysis of complex systems such as the management of water quality in the Lake Erie Basin.
W72-09787

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

ECONOMICS AND THE ENVIRONMENT, A MATERIALS BALANCE APPROACH,
Resources for the Future, Inc., Washington, D.C.; and California Univ., Riverside. Dept. of Economics.
A. V. Kneese, R. U. Ayres, and R. C. D'Arge.
Resources for the Future, Inc., Washington, D. C. 1970. 120p, 22 tab, 13 charts. Price $2.50.

Descriptors: *Economic efficiency, *Environmental effects, *Pollution abatement, Mathematical models, Welfare (Economics).
Identifiers: *Production, *Residuals, *Conservation of matter, *Materials balance, Externalities.

In an economy which is closed and where there is no net accumulation of stocks, the amount of residuals which is inserted into the natural environment must be approximately equal to the weight of basic fuels, food, and raw materials entering the processing and production system, plus oxygen taken from the atmosphere. This materials balance concept is elaborated, and numerous empirical results related to it are provided. Also, the materials balance concept is related by a formal mathematical model to the concept of a general equilibrium in exchange. This model suggests how the more simplified versions of economic general interdependency models might be used to provide more coherent and accurate projections of residuals discharge as a function of the final products of an economy. The desirability of establishing a set of coherent and consistent environmental standards in the presence of pervasive and interdependent externalities resulting from residuals discharge is considered. Once established, these environmental standards would become part of the overall framework within which voluntary market exchanges take place. If these standards are considered as fixed constraints on the system, the conditions of Pareto optimality can be met within them. (Settle-Wisconsin)
W72-09139

EXTERNALITIES AND PUBLIC GOODS,
London Graduate School of Business Studies (England).
S. E. Holtermann.
Economica, Vol. 39, No. 153, p 78-87, February, 1972. 15 ref.

Descriptors: *Mathematical models, Economics, Economic efficiency, Prices, Model studies, Evaluation, Benefits, Cost-benefit analysis.
Identifiers: *Externalities, *Public goods, *Optimality conditions, *Mixed goods.

A precise analysis of the relationships between public goods and externalities is presented, and a model which covers those mixed goods which lie somewhere between pure private goods and pure public goods is formulated. Whether or not a good constitutes an externality depends on the manner in which it is exchanged: if no compensation is paid except as a result of public intervention then a good is an external good; external goods are exchanged by some means other than the traditional price mechanism. Whether or not a good is a public good depends on the characteristics of the good: the total supply of a pure public good enters the consumption or production vector of each economic agent affected by it. The important factor that determines a mixed good is the distinction between the availability, or output, of a public good, and the utilization of it. Conceivably, both the availability of the good and the individual's utilization of it may be significant but separate factors affecting an individual's utility. The optimality conditions derived from a simple mixed goods model differ from the optimality conditions derived for both pure private goods and pure public goods. (Settle-Wisconsin)
W72-09143

USE OF GENERAL EQUILIBRIUM IN REGIONAL WATER RESOURCE PLANNING.
Georgetown Univ., Washington, D.C.

Copy available from GPO Sup Doc, $1.50; microfiche from NTIS as PB-209 893, $0.95. Environmental Protection Agency Water Pollution Control Research Series, January, 1972. 162 p, 2 fig, 3 tab, 2 append, 11 ref. EPA Program 16110F1001/72.

Descriptors: *Algorithms, *Optimization, *Estimating, *Regional economics, *Prices, *Regional analysis, *Supply, *Resource allocation, *Water pollution control, *Water resources, Computer programs.
Identifiers: *Equilibrium analysis, *Public goods, *Public funds, *Externalities, *Shadow prices.

General equilibrium analysis is shown to be a feasible tool for estimating the optimal level of public goods in a regional economy and the optimal allocation of public funds to obtain the desired level. This analysis provides a methodology for investigating the externalities associated with various forms of production. An interaction or trade mechanism is presented which will force a regional economy into equilibrium with the economy in which it is embedded: Relative prices will be identical in these economies for their common commodities. A technique is presented by which all public goods can be treated in a general equilibrium framework. The results of some numeric computations indicate how the methodology works with a regional economy which has a public good. Since one of the conclusions from a general equilibrium application is the optimum supply of any commodity, this technique can be used to determine efficient and economical methods of controlling water pollution in a given region. (Bell-Cornell)
W72-09228

SYSTEMS ANALYSIS FOR WATER QUALITY MANAGEMENT - SURVEY AND ABSTRACTS.
Enviro Control, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-09229

MONITORING THE ENVIRONMENT OF THE NATION,
MITRE Corp., McLean, Va.
For primary bibliographic entry see Field 06G.
W72-09230

OPTIMAL SEARCH FOR POLLUTION SOURCES,
California Univ., Berkeley. Human Factors in Technology Research Group.
For primary bibliographic entry see Field 05B.
W72-09232

COMPUTER SOFTWARE FOR WASTEWATER TREATMENT PLANT DESIGN,
Monsanto Enviro-Chem Systems Inc., Dayton, Ohio.
For primary bibliographic entry see Field 05D.
W72-09233

HYDRO-PHYSIOGRAPHIC MODEL,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
G. Girard, R. Charbonneau, and G. Morin.
In: Proceedings (Vol. I), International Symposium on Modelling Techniques in Water Resource Systems, May 9-12, 1972, p 190-204. 3 fig, 4 ref.

Descriptors: *Model studies, *Runoff, *Basins, *Flow.
Identifiers: Kenogami Basin, Harricana River (Canada).

A new approach in developing a deterministic model for total basin runoff is proposed. The surface area of the basin or group of basins in the study area is subdivided into elementary parts, the area of each one less than or equal to a fixed limit. Then the characteristics of each part are determined. This method has several major advantages: (1) a greater similarity between the model and the flow process, (2) a flexibility allowing the model to be easily transposed to varied regions, and (3) provision for reconstructing the flows at any point in the system. (see also W72-08258) (Campbell-Cornell)
W72-09234

MULTIPURPOSE OPERATION STUDIES OF A CANAL-LAKE-RIVER SYSTEM--OSWEGO RIVER SYSTEM, NEW YORK,
New York State Dept. of Environmental Conservation, Albany. Bureau of Water Resources Planning.
For primary bibliographic entry see Field 04A.
W72-09287

WATER TREATMENT PLANT STAGING POLICY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05F.
W72-09289

INTRODUCTION OF RISK AND UNCERTAINTY CONCEPTS TO OPTIMIZATION OF WATER RESOURCES SYSTEM DESIGN,
Texas A and M Univ., College Station. Inst. of Statistics.
R. J. Freund.
Available from the National Technical Information Service as PB-209 927, $3.00 in paper copy, $0.95 in microfiche. Final Report, revised December 10, 1971. 88 p, 6 tab, 4 ref, 5 append. OWRR C-1227 (No 1600) (4).

Descriptors: *Mathematical models, *Simulation analysis, *Optimization, *Reservoirs, *Risks, *Model studies, *Planning, *Water supply, *Water resources, *Linear programming, *Stochastic processes, Methodology, Flood control, Irrigation, Crops, Farms, Watershed management, Economics, Texas.
Identifiers: *Twin Buttes Reservoir, *South Concho River, North Concho River, San Angelo Reservoir (Tex), AVCO Co.

A project was undertaken to develop mathematical models capable of incorporating elements of risk and uncertainty into the solution of optimal water resources systems designs. The basic premise is that, since risk taking is an acceptable economic alternative, it may be feasible to design a somewhat inadequate system. Simulation and some optimization techniques were used. The data base was the Twin Buttes Reservoir on the South Concho River in Texas. There were two major subprojects: (1) extensions of a simple static model developed by Bathke, and (2) study of farmers' reactions to possible uncertainties in irrigation water supply. The first is discussed in four sections: review of the model; inclusion of additional risk factors; investigation into adapting the model to a two-reservoir system; and comparison with a linear programming model. (See W72-08291 thru W72-09293). The second subproject studied two features: optimum system design variables, and farmers' reactions to uncertainty. (See W72-09294 and W72-09295) (Campbell-Cornell)
W72-09290

THE DEVELOPMENT OF A MODEL TO EVALUATE HYDROLOGIC RISK IN A WATER RESOURCE SYSTEM,
Texas A and M Univ., College Station. Inst. of Statistics.
W. L. Bathke, and R. J. Freund.
Appendix 1 of Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design, revised December 10, 1971. 19 p, 3 fig, 15 ref.

Descriptors: *Mathematical models, *Simulation analysis, *Optimization, *Reservoirs, *Risks, *Model studies, *Planning, *Water supply, *Water resources, *Linear programming, *Stochastic processes, Methodology, Flood control, Irrigation, Crops, Farms, Watershed management, Economics.
Identifiers: Twin Buttes Reservoir, South Concho River, North Concho River, San Angelo Reservoir (Tex), AVCO Co.

A technique is described for analyzing a water resource system whose inflow is subject to considerable variation, i.e. hydrologic risk. The technique is based on a combination of computer simulation and response surface technology. It includes both the development of a mathematical model describing the physical, hydrologic, and economic characteristics of a water resource system, including full and partial water deliveries for irrigation development. In order to make the solutions realistic, data from an actual watershed were used. The methodology developed in this study can readily be adapted to more complex situations. (See also W72-09290) (Campbell-Cornell)
W72-09291

THE DEVELOPMENT OF A MODEL TO EVALUATE HYDROLOGIC RISK IN WATER RESOURCES SYSTEM DESIGN,
Texas A and M Univ., College Station. Inst. of Statistics.
W. L. Bathke, R. J. Freund, and J. R. Conner.
Appendix 2 of Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design, revised December 10, 1971. 12 p, 1 fig, 1 tab, 3 ref.

Descriptors: *Mathematical models, *Simulation analysis, *Reservoirs, *Optimization, *Irrigation, *Water supply, *Cities, *Rivers, Methodology, Texas.
Identifiers: *South Concho River, *San Angelo (Tex).

A technique is described for determining optimal combinations of reservoir size and irrigation development levels, with the optimum adjusted for effects of highly variable water inflow and available moisture. A simple mathematical model describes the physical hydrologic and economic characteristics of a single reservoir irrigation and city water supply system. To make the result somewhat realistic, the methodology is applied to data derived from the reservoir system on the South Concho River in Texas and the city of San Angelo. This methodology allows for the changing of various of the input parameters, and is susceptible to considerable generalization. (See also W72-09290) (Campbell-Cornell)
W72-09292

A COMPARISON OF STOCHASTIC LINEAR PROGRAMMING AND SIMULATIONS FOR THE EVALUATION OF HYDROLOGIC ECONOMIC RISKS IN WATER RESOURCES SYSTEM DESIGN,
Texas A and M Univ., College Station. Inst. of Statistics.
J. R. Conner, and R. J. Freund.
Appendix 3 of Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design, revised December 10, 1971. 11 p, 3 tab, 4 ref.

Descriptors: *Mathematical models, *Simulation analysis, *Reservoirs, *Risks, *Model studies, *Linear programming, *Stochastic processes, *Systems analysis, *Irrigation, *Methodology, Costs, Texas.
Identifiers: Twin Buttes Reservoir (Tex).

Analytical models (stochastic linear programming) are compared with simulations, for the purpose of evaluating risks. These are the two broad categories of systems analysis techniques. In both, equations are formulated to describe the behavior of a system. In the simulation approach the system is then studied by subjecting it to various external and internal conditions as reflected by different values of system inputs and equation coefficients. Both methods produced contradictory results. The most important difference is found in the type of hydrologic inflow data used. The cost and returns functions are also represented differently. It is concluded that the simulation model is superior. (See also W72-09290) (Campbell-Cornell)
W72-09293

THE EFFECT OF RISK TAKING BY USERS OF IRRIGATION WATER,
Texas A and M Univ., College Station. Inst. of Statistics.
J. R. Conner, R. J. Freund, and M. P. Godwin.
Appendix 4 of Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design, revised December 10, 1971. 11 p, 3 tab, 4 ref.

Descriptors: *Mathematical models, *Simulation analysis, *Optimization, *Reservoirs, *Risks, *Model studies, *Planning, *Water supply, *Water resources, *Linear programming, *Methodology, *Irrigation, *Crops, *Farms, *Economics.

The effect of risk taking by users of irrigation water is discussed. It has hitherto been assumed that only planners react to the effects of risk elements, and so the influences of users' reactions have been largely ignored. That focussed on the hydrologic risk to the exclusion of risks from economic fluctuation. This study is based on the premise that the way farmers react can influence the optimum size of, and investment in, irrigation reservoirs, and provide guidelines for their operation when agriculture is a major reason for construction. The methodology is a combination of simulation and response surface techniques. The results show that the inclusion of farmers' reactions had recognizable effects on both the system design variables and the farmers' own cropping plans. This methodology could make the model more realistic by adding other factors such as effects of industrial and municipal water needs, flood protection, etc. (See also W72-09290) (Campbell-Cornell)
W72-09294

RISK PROGRAMMING: AN AID IN THE PLANNING OF A RESERVOIR - IRRIGATION SYSTEM,
Texas A and M Univ., College Station. Inst. of Statistics.
J. R. Conner, R. J. Freund, and M. R. Godwin.
Appendix 5 of Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design, revised December 10, 1971. 14 p, 4 tab, 19 ref.

Descriptors: *Mathematical models, *Simulation analysis, *Optimization, *Reservoirs, *Risks, *Decision making, *Model studies, *Planning, *Water resources, *Irrigation, *Water supply, *Farms, Crops, Costs.

Currently available theory is used for another adaptation of the 'decision making under risk' problem for farmers. The need for including this concept in the planning of a reservoir-irrigation system is discussed. Emphasis is on farmers' reactions to different reliabilities, irrigation water availabilities, and how the degree of farmers' risk aversion affects these reactions. It is shown how a water resource system model can be developed which incorporates the water user's reaction to risk and the effects of these reactions on the optimal level of design variables. The effects of the levels of the risk aversion constant on the amount of net benefits accruing to society from the system imply that water resource system planners should carefully consider the ability and desire of the users of the water to accept or avoid risk. (See also W72-09290) (Campbell-Cornell)
W72-09295

THE MASTER PLAN, TOWN OF POESTENKILL, N.Y., VOLUME 2.
Bailey (Russell D.) and Associates, Utica, N.Y.
For primary bibliographic entry see Field 06D.
W72-09300

A MASTER SEWERAGE PLAN FOR BURLINGTON COUNTY, NEW JERSEY.
Killain (Elson T.) Associated, Millburn, N.J.
For primary bibliographic entry see Field 06D.
W72-09303

A WATER PLANNING CONCEPT FOR THE STATE OF WASHINGTON.
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 06D.
W72-09308

THE ROLE OF RESEARCH AND DEVELOPMENT IN WATER RESOURCES PLANNING AND MANAGEMENT FOR ACHIEVING URBAN GOALS,
National Planning Association, Washington, D.C. Center for Techno-Economic Studies.
M. B. Spangler.
Available from the National Technical Information Service as PB210-133, $9.00 in paper copy, $0.95 in microfiche. Completion Report, May 1972. 639 p, 6 fig, 16 tab, 2 append. OWRR C-2112 (No. 3365) (1).

Descriptors: *Technology, *Water resources development, *City planning, *Decision making, *Planning, *Forecasting, *Systems analysis, *Cost-benefit analysis, *Water management, *Water pollution control, *Water requirements, *Water utilization, *Land use, *Risks, Urbanization, Zoning, Aesthetics, Social values, Political jurisdiction, Institutional constraints, Resource development, Population growth rates, Inter-basin transfers, Water allocation, Water law.
Identifiers: *Research planning, *Technology assessment, *Technology forecasting, *Technological change, *Urban goals, *Cost-effectiveness analysis, *Environmental quality, *Environmental protection, Decision criteria, Goals, Priorities, Social choice, Information requirements, Matrix evaluation, Population forecasting, Institutional alternatives, Amenity values.

A trimatrix approach is proposed for evaluating the impacts of technological alternatives on different urban uses of water and related land areas and, in turn, the impacts of these uses on urban goals and values. This provides a systematic accounting system for mapping the interrelationships of the decision criteria of the research planner, the water resources planner, and the urban planner. This analytical tool is quite useful to the process of technology assessment which is receiving increased emphasis nationally and internationally in making new technologies more responsive to social needs as reflected in the desire to protect and enhance the quality of the environment and the quality of urban living. The trimatrix method was applied to contrasting case studies of the urban water and related land uses and potential technological developments affecting the Phoenix and Baltimore metropolitan areas. The case studies revealed the highly complex nature of the technology assessment process and the difficulty of evaluating impacts on urban goals and values. Numerous information deficiencies need to be surmounted in refining the methodology and developing more socially optimal planning decisions affecting water resource utilization in achieving urban goals.
W72-09788

6B. Evaluation Process

ECONOMICS AND THE ENVIRONMENT, A MATERIALS BALANCE APPROACH,
Resources for the Future, Inc., Washington, D.C.; and California Univ., Riverside. Dept. of Economics.
For primary bibliographic entry see Field 06A.
W72-09139

SOME ECONOMIC ASPECTS OF RAIN STIMULATION,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 03B.
W72-09146

LONG-RUN COSTS AND POLICY IMPLICATION OF ADJUSTING TO A DECLINING WATER SUPPLY IN EASTERN WASHINGTON,
Washington, State Univ., Pullman.
For primary bibliographic entry see Field 04B.
W72-09148

USE OF GENERAL EQUILIBRIUM IN REGIONAL WATER RESOURCE PLANNING.
Georgetown Univ., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-09228

SYSTEMS ANALYSIS FOR WATER QUALITY MANAGEMENT - SURVEY AND ABSTRACTS.
Enviro Control, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-09229

POLLUTION PRICES IN A GENERAL EQUILIBRIUM MODEL,
California Univ., San Diego, La Jolla. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W72-09235

INTRODUCTION OF RISK AND UNCERTAINTY CONCEPTS TO OPTIMIZATION OF WATER RESOURCES SYSTEM DESIGN,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09290

THE DEVELOPMENT OF A MODEL TO EVALUATE HYDROLOGIC RISK IN A WATER RESOURCE SYSTEM,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09291

RECREATIONAL USE OF THE COLUMBIA RIVER: EVALUATION OF ENVIRONMENTAL EXPOSURE,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
J. F. Honstead.
Available from NTIS, Springfield, Va. BNWL-CC-2299 $3.00 papercopy, $0.95 microfiche. Rept. No. BNWL-CC-2299, Oct. 7, 1969, 16 p.

Descriptors: *Radioactive wastes, *Effluents, *Water pollution, *Columbia River, *Measurement, *Assay, Water pollution sources, Human pollution, Radioactivity effects, Public health, Social aspects, Outdoor recreation, Water sports, Washington.
Identifiers: Radiation exposure, Concentration, Dose calculation, Richland (Wash).

A total of 430 teen-age students in Richland Washington, schools were questioned concerning their use of the Columbia River for recreation purposes. The survey investigated the frequency and length of swimming trips, water skiing trips, fishing and hunting trips and picnics associated with the Columbia River. The data are to be used in evaluating the external dose received by the Richland residents from the radioactivity in the Columbia River and accumulated along the shoreline. Individual teen-agers were examined with regard to their possible external exposure and values of up to 68 mR were obtained in extreme cases. (Houser-ORNL)
W72-09426

HIGH DENSITY FISH CULTURE.

Available from the National Technical Information Service as COM71-01114, $3.00 in paper copy, $0.95 in microfiche. Proceedings of a conference held at Skidaway Inst. of Oceanography, Skidaway Island, Savannah, Georgia, February 1970. J. W. Andrews, editor. 80 p, 5 fig, 13 tab, 2 ref, 3 app. 7301000/PL 88-309. 2-84-R.

Descriptors: *Fish farming, *Catfishes, *Channel catfish, Aquiculture, *Fish management, Marine biology, Fisheries, Resources, Engineering, Marketing, Economics.

Discussions at the conference centered around high density catfish culture, although much information was applicable to high density fish culture in general. The intensive production of channel catfish in tanks, pools, and raceways was discussed. Nutritional aspects, disease and parasite control, and potential genetic improvement in growth and disease resistance of catfish were considered. Economic, marketing, and engineering aspects of high density culture were also discussed. (Svensson-Washington)
W72-09522

EXTENDING THE UTILITY OF NON-URBAN WATER SUPPLIES,
Utah State Univ. Foundation, Logan.

Available from the National Technical Information Service as PB-207 115, $3.00 in paper copy, $0.95 in microfiche. National Water Commission Report NWC-EES-72-033, July 1971, 254 p, 319 ref. NWC 71-003.

Descriptors: *Economics, *Water supply, Irrigation, Education, *Water resources development, *Decision making, Environment, Economic efficiency, Recreation, Social values, Water conservation, Aesthetics, Institutional constraints, Water quality, Water management, Technology.

Identifiers: Water efficiency, Non-urban water supply.

The concept of extending the utility of non-urban water supplies in a given hydrologic complex;; the conditions for achieving greater utility in both a physical and socio-economic sense; and some things that might lead to better utilization from a regional or public perspective are discussed. Some semantic and conceptual difficulties in using efficiency terms for comparing nonhomogeneous uses in single and aggregated use configurations are discussed. Physical and managerial possibilities and opportunities for extending the utility of a given water supply are outlined with consideration of the institutional, legal, political, and economic constraints which inhibit or restrict the attainment of these technical or managerial potentials. Recommendations for policy, action, and research programs are given. (NWC)
W72-09525

ENVIRONMENTAL EVALUATION SYSTEM FOR WATER RESOURCE PLANNING,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 06G.
W72-09560

PROBLEMS IN THE UTILIZATION OF WATER RESOURCES (PROBLEMY ISPOL'ZOVANIYA VODNYKH RESURSOV).
Belorusskii Nauchno-Issledovatelskii Institut Melioratsii i Vodnogo Khozyaistva, Minst (USSR).
For primary bibliographic entry see Field 08B.
W72-09644

THE WESTWIDE WATER STUDY,
Bureau of Reclamation, Washington, D.C.
W. D. Fairchild.
Journal of the American Water Works Association Vol. 63, No. 11, p 706-710, Nov. 1971.

Descriptors: *Water resources, *Planning, *Water resources development, Industries, Agriculture, Environment, Social aspects, Policies, Weather modification, Desalination, Water reuse, Optimum development plans, Water requirements, Water utilization.
Identifiers: *Westwide Water Study, Western United States, Population growth, Geothermal resources.

The purpose of the Westwide Water Study (WWS), one of the most comprehensive water resource investigations ever undertaken in the US, is to develop a general plan to meet future water needs of the 11 Western States. The WWS is a complete reconnaissance to develop a general plan with the following objectives: (1) to project the future population, industry, agriculture, environment, and social makeup of the West, (2) to determine potential water supply from all available sources, (3) to translate projections of future conditions into water requirements and balance these requirements against available and potential water supply, and (4) to develop an optimum plan to meet these needs. The WWS organization consists of 4 basic groups: policy, advisory, management, and implementation. These groups will study several water resource potentials, including weather modification, desalting, geothermal development, and wastewater reclamation; and consider the protection and enhancement of the environment during development. Findings and recommendations will provide new perspectives on water resource development and will have an immeasurable influence on western and national growth for many years. (USBR)
W72-09701

THE ROLE OF RESEARCH AND DEVELOPMENT IN WATER RESOURCES PLANNING AND MANAGEMENT FOR ACHIEVING URBAN GOALS,
National Planning Association, Washington, D.C. Center for Techno-Economic Studies.
For primary bibliographic entry see Field 06A.
W72-09788

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

CAPITAL AND OPERATING COSTS--AWT,
Cham/Hill, Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W72-09140

RATE PHILOSOPHY,
Portland Water Bureau, Oreg.
R. C. Hyle.
Journal of the American Water Works Association, Vol. 63, No. 11, Part 1, p 682-687, 1971.

Descriptors: *Water demand, *Water supply, *Costs, *Equitable apportionment, Use rates, Forecasting, Management.

Water rates tend to change slowly in response to changes in other parts of the economy; this lag may be due to political constraints as well as to the factors affecting demand and supply. In the long run, the industry may be under little economic pressure to increase rates. The high rate of investment per dollar of revenue means that fixed costs underlie a large part of the price charges. If the utility is growing, the decline in average fixed costs tends to offset increases in operating costs; if debt is retired, the relief from debt service may more than compensate for other cost increases. In practice, water rates tend to be such that the water users provide the revenue needed to keep the utility solvent. While revenue bonds now constitute virtually all major financing, it is still the water customer who pays. In theory, water users should pay for only a portion of the capital construction. Some construction and replacement costs should be met from general tax funds, for instance. Furthermore, main extensions and other improvements supplied to a limited area should be financed chiefly by those directly benefited. (Settle-Wisconsin)
W72-09142

THE ECONOMIST'S APPROACH TO POLLUTION AND ITS CONTROL,
Massachusetts Inst. of Tech., Cambridge. Dept. of Economics.
R. M. Solow.
Social Science, Vol. 47, No. 1, p 15-25, 1972. 5 ref.

Descriptors: *Pollution abatement, *Economic efficiency, *Taxes, Water pollution, Air pollution, Regulation, *Waste disposal.
Identifiers: *Conservation of mass, *Materials disposal, *User fees, *Subsidies.

When considering the problems associated with pollution, we need to take account of the fundamental physical law of the conservation of mass. We speak of 'consumption' as if nothing is left of goods after they are consumed. But of course everything is left of them. In principle, then, the residuals from production weigh as much as the original weight of materials. Unless it is recycled, all this has to be returned to the environment in one way or another. In 1965, the estimated total weight of basic materials produced in (or imported into) the United States was 2492 million tons, a figure 10 percent higher than in 1963. Thus, there is no major air pollution problem or water pollution problem; there is a materials disposal problem. One proposal aimed at mitigating this problem, which may not be immediately practical but at least points in the right direction, is that the government collect a materials-use fee on specified materials removed from the environment. The fee would be such to equate private and social costs, assuming the materials were eventually disposed of in the most harmful manner. Fee refunds would be made, depending on the actual manner of disposal. (Settle-Wisconsin)
W72-09145

LONG-RUN COSTS AND POLICY IMPLICATION OF ADJUSTING TO A DECLINING WATER SUPPLY IN EASTERN WASHINGTON,
Washington, State Univ., Pullman.
For primary bibliographic entry see Field 04B.
W72-09148

POLLUTION PRICES IN A GENERAL EQUILIBRIUM MODEL,
California Univ., San Diego, La Jolla. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W72-09235

LIQUID WASTES FROM CANNING AND FREEZING FRUITS AND VEGETABLES.
National Canners Association, Berkeley, Calif. Western Research Lab.
For primary bibliographic entry see Field 05D.
W72-09390

COST OF WASTE TREATMENT IN THE MEAT PACKING INDUSTRY,
Wichita State Univ., Kans. Dept. of Economics.
For primary bibliographic entry see Field 05D.
W72-09397

POLLUTION: CLEANING UP COSTS MONEY,
For primary bibliographic entry see Field 05G.
W72-09461

6D. Water Demand

RATE PHILOSOPHY,
Portland Water Bureau, Oreg.
For primary bibliographic entry see Field 06C.
W72-09142

WATER TREATMENT PLANT STAGING POLICY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05F.
W72-09289

THE MASTER PLAN, TOWN OF POESTENKILL, N.Y., VOLUME 2.
Bailey (Russell D.) and Associates, Utica, N.Y.

Available from the National Technical Information Service as PB-189 305, $3.00 in paper copy, $0.95 in microfiche. The Town of Poestenkill, Rensselaer County, New York, January 1970. 50 p, 24 fig, 7 tab. HUD supported.

Descriptors: *Planning, *Urbanization, *Comprehensive planning, *City planning, *Rural sociology, Cummunity development, Rural areas, New England, Land development, Land use, Schools (Education), Roads, Highways, Urban planning, Flood plains.
Identifiers: *Transportation planning, *Poestenkill.

Volume 2 contains proposals for town development, transportation and community facilities. These proposals are based upon the background material and summaries of land use and quality of housing contained in Volume 1. A town design plan is included. It outlines specific action proposals with respect to the visual environment and suggests relationships to other program elements. Especially important will be the implementation of Poestenkill Center, transportation and park and recreation recommendations. An outline

of plans for development of transportation elements is included. Poestenkill must rely on highways for transportation. Higher levels of government are responsible for all of the important transportation elements. A modest highway improvement program centered around the protection of Poestenkill's scenic resources will be adequate to meet the Town's projected future needs. The report discusses the quality and adequacy of community facilities in Poestenkill and advances recommendations for establishing, developing, and maintaining appropriate parks, playgrounds and playfields, schools, and public buildings. This planning program is based on what can now be determined. Generally, this relates to natural features - the areas with: steep slopes, high watertable, poor soil conditions and floodable areas. Specific economic and social values have been identified - a viable agricultural area, water and natural area resource preservation, respect for soil and topographical features. (Poertner)
W72-09300

A MASTER SEWERAGE PLAN FOR BURLINGTON COUNTY, NEW JERSEY.
Killain (Elson T.) Associated, Millburn, N.J.

Board of Chosen Freeholders, Mount Holly, New Jersey, April 1969. 202 p, 23 fig, 16 tab.

Descriptors: *Planning, *Waste water disposal, *Sewerage, *Waste water treatment, *New Jersey, Sewage, Sewage disposal, Urbanization, Comprehensive planning, Water resources development, Local governments.
Identifiers: *Burlington County, *Master sewerage plan.

Recommendations are presented for developing regional sewerage facilities in Burlington County for the collection, treatment and disposal of domestic and industrial wastes with the view toward minimizing the effect upon the receiving streams. Burlington County is the largest County in the State of New Jersey, with an area of 819 square miles. Approximately one-half of the County land area drains westerly in the Delaware River. The easterly portion of the County drains into the Mullica River and its tributaries, and eventually into Great Bay. Because of the size of Burlington County and the low density of population in the relatively undeveloped portions of each watershed, the construction of a single central treatment plant with long, large and costly interceptor sewers within each watershed could not be economically justified. Implementation of portions of a regional or watershed plan appears to be warranted and necessary at this time in many areas of the County. The enlargement and the increased use of some of the larger existing treatment plants should be encouraged, and service provided to outlying areas in need of sewers. It is recommended that a stage program of construction be undertaken in the watersheds of Burlington County for the regional treatment facilities to be provided. In order to implement the proposed county programs the availability of substantial State and Federal funds will be essential. (Poertner)
W72-09303

A WATER PLANNING CONCEPT FOR THE STATE OF WASHINGTON.
Washington State Water Research Center, Pullman.

September 1970. 68 p, 9 ref.

Descriptors: *Planning, *Washington, *Water resources development, *Administration, *Water policy, Governments, State governments, Coordination, Comprehensive planning, Water development.
Identifiers: *State water plan.

A study was made to develop the philosophy, guidelines, and structure of the State organizational mechanisms within which a State Water Plan can be produced. The following points are stressed in the report: (1) legal authorization for a water planning agency must be developed; (2) continued funding must be assured; (3) careful consideration must be given to the selection of the director and staff; (4) advisory committees should be established, (5) an evaluation should be made of the mechanisms available for establishing liaison; (6) an evaluation should be made of the availability of physical, political, legal and social resources data; (7) an evaluation should be made of existing water-resource planning documents, legislation and administrative policies; and (8)an evaluation should be made of planning goals and objectives that may have been proposed by other State of Washington agencies. The report underlines the need for dedication by the State to change the fragmented water resource planning now prevalent and to develop a strong coordinating group to ensure that individual plans mesh into an integrated State plan. (Poertner)
W72-09308

WATER AND LAND RESOURCES, OUACHITA RIVER BASIN IN ARKANSAS,
Arkansas Soil and Water Conservation Commission, Little Rock.
R. G. Andrews, and E. A. McRae.
Little Rock, July 1970. 83 p, 27 fig, 19 tab, 15 ref.

Descriptors: *Water demand, *Water supply, *Arkansas, *Consumptive use, *Land resources, *Planning, Agriculture, Water control, Water pollution, Administration, Land development, Water resources development, Fiber crops, Food and cover crops, Water pollution sources, Watersheds, Flood control, Aquifers, Erosion control, River basin development, Water conservation, Soil conservation.
Identifiers: *Ouachita River Basin, Resource conservation.

This report appraised the following items pertinent to the Ouachita River Basin in Arkansas: (1) available water supply in terms of quantity and quality; (2) extent and nature of the present water use and pollution; (3) estimated future water needs and availability; (4) available land resources for food and fiber production and mineral resources; and (5) capability of land resources to meet future needs. The Ouachita River Basin consists of 11,548 square miles in the south central part of Arkansas. Population estimates foresee increased urbanization. The principal economic activities are agriculture, forest products, mining and recreation. The basin is rich in water resources; however it is subject to extremes of flood and drouth. Water management is needed to conserve the excess for use during periods of shortage. Water quality is generally excellent, although man-made pollution has seriously affected the quality in some areas. Frequent periods of high precipitation and the resultant rapid run-off make flash floods common. The Corps of Engineers has installed extensive facilities for flood control, and there appears to be no urgent need for additional flood control works. With proper management, available water supplies seem adequate to meet all foreseeable needs. Quality rather than quantity will probably be of greatest concern in the future. (Poertner)
W72-09309

AGRICULTURAL WATER DEMANDS,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
E. O. Heady, H. C. Madsen, K. J. Nicol, and S. H. Hargrove.
Available from the National Technical Information Service as PB-206 790, $6.00 in paper copy, $0.95 in microfiche. National Water Commission Report NWC-F-72-031, Nov. 1971, 397 p. NWC 71-013.

Descriptors: *Forecasting, *Arable land, Water supply, Water utilization, *Irrigated land, *Irrigation, Mathematical models, Linear programming, *Water demand, Agriculture.
Identifiers: Alternative futures.

The primary objective is to determine whether the Nation has enough water and land to satisfy its future food and fiber needs. Secondary objectives are to estimate agricultural demands for water, to illustrate the substitutions between water and land and to estimate levels of commodity prices, value of water rights and land rents related to water use alternatives. The study is based on a large-scale linear programming model of U.S. agriculture. The analysis incorporates alternative sets of parameters for (1) population, (2) water prices, (3) technological advance, (4) exports and (5) absence or existence of government supply control programs. All projections are for the year 2000. A general conclusion is that projected domestic food and fiber and export demands will not press against available water and land resources in 2000. Thus, present land surpluses can substitute for future water and irrigated land development projects in agriculture. Although an absolute water shortage is not projected for 2000, an efficient distribution of water supplies still will be a problem. (NWC)
W72-09526

CHARACTERISTICS OF STREAMFLOW AT GAGING STATIONS IN SHELL CREEK, ELKHORN RIVER, AND SALT CREEK BASINS, NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 02E.
W72-09556

GEOLOGIC AND HYDROLOGIC STUDY OF NORTHERN SARDINIA: REPORT NUMBER 3. THE PROVISION OF WATER FOR THE REGION OF ANGLONA, (IN ITALIAN),
Sassari Univ. (Italy). Faculty of Medical Chirurgy.
U. Alamanni, B. Dettori, A. Maida, and S. Pettinato.
Studi Sassaresi Sez Arch Bimes Sci Med Nat. Vol 47, No. 5/6, p 375-417. 1969. Illus. Maps. (English summary).
Identifiers: *Anglona (Italy), *Water resources, Sardinia, *Water demand, Water quality.

Water resources already existing in the zone (water-ways, springs and wells) and places that can be utilized for the construction of artificial lakes are noted. The quantity of water gushing out of 44 main springs of the 294 found to exist in this zone will satisfy the water demand estimated until the year 2015 on the basis of the General Italian Aqueducts Plan. The chemical and bacteriological quality of the waters of this region were studied.--Copyright 1972, Biological Abstracts, Inc.
W72-09781

6E. Water Law and Institutions

CLOSING CIRCLE ON ENVIRONMENTAL ECONOMICS,
T. T. Bradshaw.
Chemical and Engineering News, Vol. 50, No. 8, p 22-33, February 21, 1972.

Descriptors: *Pollution abatement, *Political constraints, *Profit, Productivity, Economic efficiency.
Identifiers: LIncentives, *Externalities, Internalization.

The environmental theories of environmentalist Barry Commoner and lawyer-economist Louis O. Kelso are discussed. Commoner links our current environmental degradation to the profit motive, or the drive to get ahead. The profit motive has, for instance, resulted in the replacement of many 'environmentally successful' products by many environmentally harmful products. Since 1946 the production of non-returnable soda bottles has increased by 53,000 per cent; synthetic fibers by 5980 per cent; mercury used for chlorine production by 3930 per cent; and plastics by 1960 per cent. Commoner emphasizes the need to alter our economic and political institutions so that the

profit incentive becomes less important than it presently is. In his approach to the environmental problems, Kelso emphasizes the failure of our current economic system to fully account for the productivity of capital. His solution is similar to a universal profit-sharing plan. The idea is that everyone must participate directly in the productive process and produce real wealth. Then, after internalization of external diseconomies has been enforced by the government, the consumer can better afford to pay the extra costs of cleaning up the environment. (Settle-Wisconsin)
W72-09144

COORDINATION DIRECTORY FOR PLANNING STUDIES AND REPORTS, AUGUST 1971.
Water Resources Council, Washington, D.C.

United States Water Resources Council Directory, October 1971. 117 p, 31 fig.

Descriptors: *Inter-agency cooperation, *Water Resources Planning Act, *Investigations, Data collections, River basin development, Management, Decision making, Land management, Comprehensive planning, Watershed management.
Identifiers: *Directory, Water Resources Council.

The directory updates and sets forth the various offices and addresses of agencies represented on the Water Resources Council and all other Federal, State, local and private interests concerned with the investigation and development of water and related land resources. It provides a description of agency areas of interest and responsibility, and information on distribution of notices of investigation. The Council will review the Directory periodically and issue necessary revisions. This directory is available in loose-leaf form and may easily be kept current so that all water and related land resources planning agencies may be able to contact one another. (Lang-USGS)
W72-09273

THE EFFECT OF CHANNELIZATION ON THE ENVIRONMENT.
Congress, Washington, D.C.; and Committee on Public Works (U. S. Senate).
For primary bibliographic entry see Field 05G.
W72-09459

PRESIDENT'S MESSAGE--ENVIRONMENTAL PROTECTION,
R. M. Nixon.
U.S. Code Congressional and Administrative News, Vol. 2, p 605-619, 1972. (Cong. Rec., Vol. 118, p H840 (daily ed.).

Descriptors: *Planning, *Legislation, *Federal government, *Water pollution control, *Environmental sanitation, Legal aspects, Economics, Environmental effects, Waste disposal, Sediments, Technology, Energy, Pesticides, Land use, Wetlands, Wildlife, Fish, Migratory birds, Recreation, International law, United Nations, United States, Oil pollution, Treaties.

After listing projects begun in 1971, the President outlined the course for the future. The federal government will attempt to tighten pollution control through: (1) the Toxic Wastes Disposal Control Act, (2) regulatory programs to control sediment from construction activity, and (3) development of new technology to produce clean energy. New technology will be applied to the development of integrated pest management. Land use will be improved through expansion and strengthening of the National Land Use Policy Act and programs for the protection of wetlands. A plan for protecting our natural heritage will include the following programs: (1) protection of endangered species, (2) creation of the Big Cypress National Fresh Water Reserve in Florida, (3) national recreation areas around New York Harbor and the Golden Gate, and (4) creation of new wilderness areas. To coordinate international action the President asked for funds for the United Nations Conference on the Human Environment and action to ratify conventions and implement legislation for control of marine pollution on the high seas. The President forecasted that environmental protection will be no easy task: it will require assistance from all segments of society. (Ilkson-Florida)
W72-09460

RIGHTS AND RESPONSIBILITIES OF ARCTIC COASTAL STATES: THE CANADIAN VIEW,
Department of External Affairs, Ottawa (Ontario).
J. A. Beesley.
Journal of Maritime Law and Commerce, Vol. 3, p 1-12, October 1971. 21 ref.

Descriptors: *Environmental control, *Jurisdiction, *Arctic Ocean, *Law of the sea, *Canada, Legal aspects, Governments, Arctic, Environmental effects, Oceans, Ships, Navigation, Oil pollution, Oil spills, International law, Permafrost, Polar regions, Ice, Ice cover, Ecology, Water pollution, Water pollution control, Pollution abatement, Foreign countries.
Identifiers: *Arctic Waters Pollution Prevention Act (Canada), *Coastal waters.

The question involved with 'Arctic sovereignty' is under what authority uses of Arctic waters and ice will be regulated and controlled (leaving aside the question of exploitation of the continental shelf). The United States has asserted the Arctic is governed by the law of the sea. Because most of this area is covered with ice throughout the year, Canada feels the law of the sea is irrelevant. Local inhabitants use the frozen sea as a land extension far more than as water. Where shipping routes do exist they have been developed through the efforts of the coastal state. The Arctic's unique environmental characteristics can effect the quality of life in vast regions of North America. Canada feels the Arctic's special characteristics give it special status. Meeting its responsibility to preserve the ecology of this area, Canada adopted the Arctic Waters Pollution Prevention Act which allows Canada to preclude the passage of ships threatening environmental pollution. Canada has also extended its territorial sea to twelve miles. This gives Canada jurisdiction of two key 'gateways' to the Northwest Passage. A review of international law indicates that Canada has acted properly in adopting the Act. (Ilkson-Florida)
W72-09465

INTERNATIONAL AND NATIONAL APPROACHES TO OIL POLLUTION RESPONSIBILITY: AN EMERGING REGIME FOR A GLOBAL PROBLEM,
For primary bibliographic entry see Field 05G.
W72-09467

LE VAN V. HEDLUND PLUMBING AND HEATING (ADJACENT LANDOWNERS OBLIGATION TO ACCEPT NATURAL DRAINAGE OF SURFACE WATERS).

194 N.W.2d 725-727 (Ct. App. Mich. 1971).

Descriptors: *Michigan, *Adjacent landowners, *Surface runoff, *Negligence, Watercourses (Legal aspects), Judicial decisions, Surface waters, Drainage water, Runoff, Easements, Legal aspects, Precipitation excess, Rain water, Repulsion (Legal aspects), Riddance (Legal aspects), Surface drainage, Damages.
Identifiers: Common enemy rule.

Plaintiff landowner sued for damages, alleging that defendant adjoining landowners had by earth fill caused the level of their land to be raised to a point where it would no longer accept surface waters flowing in their natural course from plaintiff's land, with the result that the waters had accumulated on plaintiff's land, damaging his property. Defendants admitted filling their land, but denied any negligence or obligation to accept surface water from plaintiff's land. The trial court held for plaintiff, finding that his was the dominant land and defendant's the servient. The Court of Appeals of Michigan affirmed, finding that the trial court was correct in holding that the average prudent man possessing knowledge of the natural surface water flow should have known that the raising of defendants' land would cause water problems for plaintiff and that failure to provide for this was negligence. The owner of lowlands must accept surface water which naturally drains onto his land. Defendants not only refused to accept this surface water by raising the surface of their land, but they also cast this water onto plaintiff's land, causing damage. (Ilkson-Florida)
W72-09469

ATTORNEY GENERAL V. BALDWIN (NON-COMPLIANCE WITH TERMS OF PERMIT TO FILL).

279 N.E.2d 710-717 (Sup. Jud. Ct. Mass. 1972).

Descriptors: *Earth fill, *Massachusetts, *Estuaries, *Permits, Tidal waters, Judicial decisions, Appeals, Statutes, Water law, Piers, Culverts, State governments, Administrative agencies.

Defendants were granted a license to place fill on certain tidelands in a creek area. Continued use of the license was conditioned upon defendants' compliance with certain requirements, including construction of a pier and a reinforced concrete culvert. Plaintiff attorney general brought suit to enjoin the continuance of defendants' operations and to compel their removal of fill that had already been deposited. The Supreme Judicial Court of Massachusetts held that defendants had abused their license by failing to construct the culvert and pier. This result was reached even though public funds had earlier been appropriated for completion of the required construction. The court also held that the lower court was correct in requiring defendants to remove the fill already deposited. The court justified its holding by the fact that defendants had never intended to comply with their license and that they were notified during construction that their work was improper. (Waldron-Florida)
W72-09470

COOK INDUSTRIES V. CARLSON (RIGHT OF SUMMARY ABATEMENT OF PRIVATE NUISANCE).
334 F. Supp. 809-820 (N.D. Miss. 1971).

Descriptors: *Judicial decisions, *Easements, *Industrial wastes, *Waste water treatment, Waste disposal, Water pollution, Effluents, Waste water disposal, Legal aspects, Discharge (Water), Damages.
Identifiers: *Nuisance (Legal aspects).

Plaintiff corporation, lessee/operator of industrial property and city as lessor/owner, sued defendant owners of adjoining property to require opening of a drainage ditch and for damages for the closing of the ditch. Plaintiff held an easement for drainage across defendants' property. For three and one half years plaintiff had discharged polluted and contaminated water into the ditch. After numerous complaints defendants blocked the ditch to gain publicity and community support. The United States district court ruled that defendants exceeded any right of summary abatement in blocking the ditch. The court further decided that plaintiff's easement did not extend to its enlarged and changed use and such use amounted to a private nuisance. Defendants were required to open the ditch and pay nominal damages for its closing. Plaintiff was required to pay nominal damages for private nuisance and were given a limited time to effect a remedy by eliminating the offensive odors and unsightly appearance resulting from its discharges into the ditch. (Nielsen-Florida)
W72-09471

U.S. OPPOSES UNILATERAL EXTENSION BY CANADA OF HIGH SEAS JURISDICTION.
Department of State, Washington, D.C.

Department of State Bulletin, Vol. 62, p 610-611, 1970.

Descriptors: *International law, *Governmental interrelations, *Law of the sea, *Water pollution control, *Canada, *Jurisdiction, Political constraints, United States, United Nations, Legal aspects, Boundaries (Property), Governments, Legislation, Navigation, Arctic, Fisheries, International waters, International commissions, Foreign countries, Supervisory control (Power).
Identifiers: *Coastal waters.

The State Department opposes the Canadian Government's introduction of two bills in the House of Commons dealing with pollution in the Arctic, fisheries, and the limits of the territorial sea. The bills seek to establish pollution zones in Arctic waters up to 100 miles from the coast. Within these zones, Canada would assert the right to control all shipping and prescribe standards of vessel construction, navigation, and operation. Additionally, Canada seeks to establish exclusive fisheries in areas of the high seas beyond 12 miles. International law provides no basis for these unilateral extensions of jurisdiction. These actions may be taken as precedent for other unilateral infringements of freedom of the seas. The U.S. has long sought international solutions to problems of the high seas through the United Nations. Canada should attempt to effect a change within the international framework and should defer making the bills effective until an internationally agreed solution is arrived at. If, however, the Canadian Government is unwilling to await international agreement, the case should be submitted to the International Court of Justice. (Ilkson-Florida)
W72-09472

A STATUTORY ANALYSIS OF FLORIDA'S WATER POLLUTION CONTROL LEGISLATION,
Florida Univ., Gainesville. Coll. of Law.
C. L. Johnson.
Unpublished seminar paper, Law Library, University of Florida, February 29, 1972. 44 p, 109 ref, 1 append.

Descriptors: *Florida, *Law enforcement, *Administrative agencies, *Water pollution control, *Pollution abatement, Permits, Pollution taxes (Charges), Tennessee, Penalties (Legal), Water quality standards, Water law, Legislation, Administrative decisions, Water quality control, Water pollution, Thermal pollution, Regulation, Water resources development, Legal review, State governments, State jurisdiction, Comprehensive planning, Water policy.
Identifiers: *Public trust doctrine, Injunction (Mandatory), Injunction (Prohibitory).

Chapter 403, Florida statutes, is examined and compared with the Tennessee Water Quality Control Act of 1971. Legislative adoption of the public trust doctrine could be used to remedy Florida's lack of an affirmative legislative commitment to prevent water pollution. The definition of several key statutory terms and the duties of the Department of Pollution Control should be clarified and expanded. The membership, control, and duties of the Pollution Control Board need more statutory definition and limitation. A recently enacted permit system for waste discharges is deficient in that it fails to impose any penalty for certain discharges without a permit. To be adequate, the permit system should provide effective control over all discharges. The enforcement procedure behind the Act is only applicable after a violation has occurred, and no provision is made for compliance with the regulations of the Department before violations are cited. The statutory hearing procedures allow delays which can prevent the quick disposition of alleged violations. The imposition of a user-surveillance fee is one method of defraying water pollution control costs. A table comparing the Florida Act and the Tennessee Act, the text of the Florida Act, and the text of the Tennessee Act are included. (Johnson-Florida)
W72-09479

U.N. ADOPTS PRINCIPLES GOVERNING SEABED EXPLOITATION AND DECIDES TO CONVENE COMPREHENSIVE LAW-OF-THE-SEA CONFERENCE IN 1973.

Department of State Bulletin, Vol. 64, p 150-159, 1971. append.

Descriptors: *Ownership of beds, *United Nations, *International law, *Exploitation, *Law of the sea, Mining, Beds under water, International waters, Regulation, Continental shelf, Administrative agencies, Administration, Jurisdiction, Governmental interrelations, Governments, United States, Oil industry, Political aspects, Political constraints, Institutional constraints, Legal aspects, Boundary disputes, International commissions.

Included are the statements of Senator Pell and State Department Legal Adviser John R. Stevenson made in Committee I (Political and Security) of the United Nations General Assembly. Also included are texts of two resolutions adopted by the Committee: (1) Declarations of Principles Governing the Sea-Bed and the Ocean Floor, and the Subsoil, Beyond the Limits of National Jurisdiction; and (2) Resolution 2750--reservation exclusively for peacful purposes of the sea-bed and ocean floor underlying the high seas beyond the limits of present national jurisdiction and use of their resources in the interests of mankind and convening of a conference on the law of the sea. Senator Pell warned the Committee of the danger of nations building colonial empires on the sea-bed. The availability of technology increases the urgency of establishing rules and institutions to insure resources are developed for the benefit of mankind. The inevitability of unilateral action, the absence of international agreement, and unknown economic factors were other reasons cited for the necessity of a convention. The United States draft resolution for convening such a convention was explained. (Ilkson-Florida)
W72-09484

PRESIDENT NIXON ASKS SENATE APPROVAL OF CONVENTIONS ON POLLUTION OF THE SEA BY OIL,
R. M. Nixon, and W. P. Rogers.
Department of State Bulletin, Vol. 62, p 756-759, 1970.

Descriptors: *Oil pollution, *Law of the sea, *International law, *Treaties, Oil, Oil spills, Ships, Water pollution, Oceans, Legal aspects, Law enforcement, Legal review, Penalties (Legal), Governmental interrelations, Governments, Coasts, International commissions, Insurance, Oil industry, Navigation, United States, Negligence, Foreign countries.

President Nixon and Secretary Rogers submit for the advice and consent of the Senate, the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, the International Convention on Civil Liability for Oil Pollution Damage, and amendments to the 1954 Oil Pollution Convention. The Intervention Convention authorizes governments to take action against oil pollution hazards from tankers on the high seas. Parties are permitted to take such measures as necessary to prevent pollution. Procedure required for taking action and for settlement of disputes arising as to the reasonableness of action taken are summarized. The Civil Liability Convention establishes rules relating to liability of an oil-carrying vessel's owner to governments and other parties for pollution damages. Requirements of insurance limits of liability, and procedures for litigation are set forth. Amendments to the Oil Pollution Convention were recommended because it will be necessary to establish rigid controls with respect to the instantaneous rate of oil content discharge, maximum oil content of discharged mixtures, and total quantities of oil discharged by tankers. The primary change is to Article III. It is based on the principle of total prohibition of oil discharge subject to certain exceptions. (Ilkson-Florida)
W72-09485

OFFSHORE OIL POLLUTION (MESSAGE FROM PRESIDENT NIXON TO CONGRESS),
R. M. Nixon.
Department of State Bulletin, Vol. 62, p 754-756, 1970.

Descriptors: *Oil pollution, *Oil spills, *Water pollution control, *Treaties, *Federal government, Water pollution sources, Water pollution, Pollution abatement, Oil wastes, Ships, Legislation, Harbors, Water quality, Water quality control, Oceans, Regulation, Oil, International waters, International law, Waste disposal, Financing, Legal aspects, Pollutants, Foreign trade, Foreign countries.
Identifiers: *Coastal waters.

The threat from oil spills can be contained through a combination of international cooperation and national initiatives. Three international agreements are being sent to the Senate for ratification. One would permit preventive action against vessels on the high seas which threaten imminent pollution danger to our coasts. The second establishes new rules prohibiting the discharge of oil within 50 miles of our coasts. The third imposes strict liability upon the owner of vessels responsible for pollution damage to coastal areas. The Secretary of State is being instructed to seek multilateral action to prescribe international standards for the construction and operation of tankers. In order to safeguard our harbors from oil pollution, the Coast Guard is being given increased regulatory powers over traffic, surveillance, and handling of dangerous cargoes. Provisions are also included for: (1) a research and development program concerning oil pollution, (2) recommendations for equipping port areas with waste oil receptacles, (3) direct radio communication between vessels maneuvering in harbors, (4) the licensing of tugboat operators, and (5) the financing of cleanup operations. (Brackins-Florida)
W72-09486

POLLUTED WATER: A CHALLENGE TO FORENSIC BIOLOGY,
Colorado State Univ., Fort Collins. Dept. of Zoology.
For primary bibliographic entry see Field 05G.
W72-09498

EXTENDING THE UTILITY OF NON-URBAN WATER SUPPLIES,
Utah State Univ. Foundation, Logan.
For primary bibliographic entry see Field 06B.
W72-09525

PUBLIC REGULATION OF WATER QUALITY IN THE UNITED STATES,
Iowa Univ., Iowa City. Coll. of Law.
For primary bibliographic entry see Field 05G.
W72-09527

STREAM CHANNELIZATION: CONFLICT BETWEEN DITCHERS, CONSERVATIONISTS,
R. Gillette.
Science, Vol 176, No 4037, p 890-894, May 26, 1972.

Descriptors: *Water management (Applied), *Channels, *Alteration of flow, *Environmental effects, Inland waterways, Channel improvements, Regulated flow, Balance of nature, Cost-benefit ratio, Wildlife management, Surface

drainage, Wetlands, Soil conservation, Aquatic habitats, Agricultural engineering, Multiple-purpose projects, Watershed Protection and Flood Prevention Act.
Identifiers: *Stream channelization, Channel alteration, Conflict of interests.

Comments and statistics about the growing conflict between conservationists and proponents of stream rechanneling are presented. A few case histories are cited and a review is made of a 1971 study by Arthur D. Little, Inc., of the economic and environmental costs and benefits of stream channelization. In this study, financed by the Council on Environmental Quality (CEQ), selected SCS projects were examined. Seventy percent of the channel projects now under construction or approved are in the Southeastern states where much of the nation's rain falls. The rechanneling of rivers began in the 1870's, when the Army Corps of Engineers began projects along the Mississippi River Valley, but it was not until Congress passed the Watershed Protection and Flood Prevention Act of 1954 that alteration of the nation's small waterways for agricultural purposes got under way in earnest. Since then the SCS has helped farmers widen, deepen, and 'straighten' more than 8,000 mi of streams in every state. The Corps has improved another 1,500 mi of waterway in the same period. State conservation agencies, federal agencies like the Department of the Interior, and many local and national groups are now arguing that biological damage by the bulldozer on a shrinking area of wetlands and the streams themselves mostly negates any economic benefits claimed by agriculture and the country as a whole. (Lang-USGS)
W72-09538

URBAN PUBLIC POLICY AND POLITICAL INSTITUTIONS FOR WATER-QUALITY MANAGEMENT ON LAKE ERIE: YEAR ONE,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 05G.
W72-09787

6F. Nonstructural Alternatives

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, SANDOVAL AND LOS ALAMOS COUNTIES,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09658

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, CHAVES COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09659

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, GRANT COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09660

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, MORA COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09661

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, DE BACA COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09662

LAND CLASSIFICATION FOR IRRIGATION, ROOSEVELT COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09663

LAND CLASSIFICATION FOR IRRIGATION, TORRANCE COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09664

SOIL ASSOCIATIONS AND LAND CLASSIFICATION FOR IRRIGATION, QUAY COUNTY,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 03F.
W72-09665

THE ROLE OF RESEARCH AND DEVELOPMENT IN WATER RESOURCES PLANNING AND MANAGEMENT FOR ACHIEVING URBAN GOALS,
National Planning Association, Washington, D.C. Center for Techno-Economic Studies.
For primary bibliographic entry see Field 06A.
W72-09788

6G. Ecologic Impact of Water Development

CLOSING CIRCLE ON ENVIRONMENTAL ECONOMICS,
For primary bibliographic entry see Field 06E.
W72-09144

ECONOMIC INFORMATION FOR ENVIRONMENTAL QUALITY MANAGEMENT,
Consortium of Universities, Washington, D. C. Urban Transportation Center.
I. K. Paik.
Available from the National Technical Information Service as PB-203 784, $3.00 in paper copy, $0.95 in microfiche. June, 1971. 18 p, 2 fig, 13 ref.

Descriptors: *Economic efficiency, *Environmental effects, *Pollution abatement, Measurement, Input-output analysis, Regression analysis, Management, Welfare (Economics).
Identifiers: *Standard of living, *Information requirements.

An attempt is made to identify the economic aspect of the total information needed for intelligent, coordinated public policy formulation for environmental control. This country's success in achieving its goals of full employment and price stability has entailed the production of enormous quantities of waste by-products which threaten to exceed nature's capacity to assimilate them. Drastic changes in our living styles may be necessary if we are to effectively combat this pollution problem. Before such changes are undertaken, however, we need to develop better information concerning the causes and effects of pollution. A new national income index that accounts for both deterioration of and improvement in environmental quality would reflect the national economic welfare better than the present income accounts. Leontief input-output models could be used to highlight the structural interdependence that exists among the industries within an economy. Furthermore, these models can expand to include pollution externalities. Econometric models can be used to analyze and estimate the economic impact of pollution control policies. For these models to achieve their greatest effectiveness, there should be widely accepted procedures for assuring consistency in measurement in all projects. (Settle-Wisconsin)
W72-09147

THE NATION'S RIVERS,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 05G.
W72-09188

MONITORING THE ENVIRONMENT OF THE NATION,
MITRE Corp., McLean, Va.
M. C. Fowler, S. N. Goldstein, R. S. Greeley, M. S. Lilienthal, and C. A. Bisselle.
Available from the National Technical Information Service as PB-205 989, $6.75 in paper copy, $0.95 in microfiche. Report MTR-1660, April 1971. 216 p, 15 fig, 20 tab. C-CEQ-3-71.

Descriptors: *Environment, *Data collections, *Data processing, *Design data, *Computer programs, Evaluation, Systems analysis.

A design concept for a system to monitor the nation's environment is presented. Described are approximately 110 environmental indices and indicators, and major data gaps in current monitoring programs which must be reduced to allow for routine computation of the indices are identified. The system concept features maximal exploitation of existing monitoring resources for collection of environmental data. An analysis of alternatives for computing environmental indices has identified advantages and disadvantages of centralized vs. decentralized processing configurations. An implementation plan is presented to achieve an initial operating capability without requiring a selection of the final processing configuration at this time. (Bell-Cornell)
W72-09230

INTEROCEANIC CANAL STUDIES, 1970.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09430

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 12-14.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09434

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 15-16,
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09435

THE EFFECT OF CHANNELIZATION ON THE ENVIRONMENT.
Congress, Washington, D.C.; and Committee on Public Works (U. S. Senate).
For primary bibliographic entry see Field 05G.
W72-09459

POLLUTION: CLEANING UP COSTS MONEY,
For primary bibliographic entry see Field 05G.
W72-09461

DEQUEEN LAKE, ROLLING FORK RIVER, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 08D.
W72-09462

LAGOON POND NAVIGATION PROJECT, MARTHA'S VINEYARD, MASSACHUSETTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 04A.
W72-09463

WILLARD, KENTUCKY. PARTIAL FLOOD PROTECTION PLAN, DRY FORK OF LITTLE FORK OF LITTLE SANDY RIVER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 08D.
W72-09464

GYPSY MOTH SUPPRESSION PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-09466

PRICE BRANCH OF LITTLE LA GRUE BAYOU, DE WITT, ARKANSAS--FLOOD CONTROL PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 04A.
W72-09468

MANSON UNIT, CHELAN DIVISION, CHIEF JOSEPH DAM PROJECT, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boise, Idaho. Region 1.
For primary bibliographic entry see Field 08C.
W72-09473

BEAR CREEK DAM AND LAKE, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineers District, Omaha, Neb.
For primary bibliographic entry see Field 08A.
W72-09474

TALLULAH CREEK WATERSHED (LONG CREEK PORTION), NORTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09475

HITSON, C AND L AND WASHBURN DRAWS, WATERSHED, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENTS).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04B.
W72-09476

FARMERS LEVEE AND DRAINAGE DISTRICT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 04A.
W72-09477

HURRICANE PROTECTION PROJECT, STRATFORD, CONNECTICUT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 08D.
W72-09478

DYERSBURG, TENNESSEE (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 08D.
W72-09480

LEVEE UNIT NO. L-246, MISSOURI RIVER LEVEE SYSTEM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 08D.
W72-09481

WESTERN UNIT FLOOD PROTECTION PROJECT, BILLINGS, MONTANA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 04A.
W72-09482

HUDSON RIVER CHANNEL, NEW YORK--OPERATION AND MAINTENANCE ACTION (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-09483

ELECTRIC POWER AND THE ENVIRONMENT.
Office of Science and Technology, Washington, D.C.

Available from NTIS, Springfield, Va. as NP-19170 for $3.00 in paper copy, $0.95 in microfiche. Report NP-19170, Aug. 1970, 80 p.

Descriptors: *Nuclear powerplants, *Radioactivity, *Radioactivity effects, *Effluents, *Air pollution, *Water pollution, *Soil contamination, *Public health, Research and development, Laboratories, Resources development, Technology, Water quality control, Administrative agencies.
Identifiers: Safety evaluation, Radiation safety, Radiation control, Codes and standards, Population response.

Electric power plants and transmission lines have become a focal point for action in responding to the national concern for protecting the environment. A growing segment of the public is protesting the intrusions on the environment resulting from the construction of electrical generating plants and transmission facilities. At the same time, the population is increasing its consumption of electricity almost faster than the power supply facilities can be built. The problem at hand is to relate and if possible reconcile these conflicting public interest concerns. A discussion of these issues and a suggested course of action for meeting power needs with minimum impact on the environment are the subjects of this report by a task force representing the federal agencies most concerned with the problem. It is a continuation of the study that resulted in the factual report on power plant siting published in January of 1969, the summary of which is reproduced as Appendix I. (Houser-ORNL)
W72-09529

ENVIRONMENTAL EVALUATION SYSTEM FOR WATER RESOURCE PLANNING,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
N. Dee, J. K. Baker, N. L. Drobny, K. M. Duke, and D. C. Fahringer.
Final Contract Report to Bureau of Reclamation, January 1972. 188 p, 78 fig, 22 tab, 30 ref. USBR 14-06-D-7182.

Descriptors: Water resources development, *Project planning, *Environmental gradient, *Planning, *Ecology, *Evaluation, Reviews, Water pollution sources, Pollution abatement, Reclamation, Water quality control, On-site investigations, Ecosystems, Vegetation, Fish land use, Hydrology, California, Streamflow, Pesticides, Sediment transport, Erosion, Wildlife, Environmental effects, Projects.

The content and structure of Battelle Columbus Laboratories system for evaluating the environmental impacts of Bureau of Reclamation projects are summarized. Research conducted to develop the system is outlined. The Bear River Project (Wyoming and Idaho) is used as a case study. Recommendations are made for implementation of the system by the Bureau of Reclamation and areas are suggested in which further refinements would be desirable. The Environmental Evaluation System represents a significant advance in the state of the art for incorporating ecological and environmental factors into the planning and evaluation of water resource development projects. The system is a synthesis of the state-of-the-art knowledge, technical skill, interdisciplinary approach, and contemporary values into a comprehensive and systematic tool for evaluating environmental impacts of water resource development. The system incorporates advanced concepts for measuring the environmental consequences of water resource development. (Woodard-USGS)
W72-09560

07. RESOURCES DATA

7A. Network Design

MONITORING THE ENVIRONMENT OF THE NATION,
MITRE Corp., McLean, Va.
For primary bibliographic entry see Field 06G.
W72-09230

SELECTED TERMS USED IN FISH CULTURE,
Food and Agriculture Organization of the United Nations, Rome (Italy). Terminology and Reference Section.
L. Moriones-Casas.
Terminology Note No 4, January 1971. 26 p.

Descriptors: *Fish, *Fish types, *Fish diseases, *Fisheries, *Fish taxonomy, Translations.
Identifiers: *Fish culture terminology, Fish species.

Terminology used in fish culture is presented in three parts: General terms, Species of fish, and Diseases of cultivated fish. In parts I and II the terms, arranged in English alphabetical order, are followed by their Spanish equivalents. In part III, the terms are listed under the Latin term of the causative agent when neither the English nor the Spanish equivalents are known. (Woodard-USGS)
W72-09261

LIST OF ORGANIZATIONS, MEETINGS, PROGRAMMES, ETC., RELATED TO FISHERIES,
Food and Agriculture Organization of the United Nations, Rome (Italy). Terminology and Reference Section.
L. Moriones-Casas.
Terminology Note No 1, Revision 1, February 1971. 35 p.

Descriptors: *Fisheries, *Organizations, *Bibliographies, *Documentation, Reviews, Programs, International commissions, United Nations, Translations.
Identifiers: Terminology.

This list offers a selection of organizational units to be found frequently in fisheries documents. The list is in English and Spanish and is arranged in English alphabetical order. The abbreviations of organizational symbols are listed alphabetically with the other entries. The English abbreviations are followed by the complete English entry and by its Spanish equivalent. In general, the names of international organizations, conventions, etc. are given under the first word of their title, while those of working parties, meetings, etc. appear under the keyword of their subject matter. Since this order could not be followed in all cases, both entries should be consulted. (Woodard-USGS)

W72-09262

A HYDROMETEOROLOGICAL DATA APPRAISAL AND DESIGN STUDY IN CERTAIN RIVER BASINS IN THE WESTERN UNITED STATES.
North American Weather Consultants, Goleta, Calif.
For primary bibliographic entry see Field 02B.
W72-09272

ENVIRONMENTAL MONITORING SYSTEM FOR NUCLEAR TESTS,
Environmental Protection Agency, Las Vegas, Nev. Western Environmental Research Lab.
For primary bibliographic entry see Field 05A.
W72-09452

7B. Data Acquisition

AN OPTICAL LIGHTNING DETECTOR,
State Univ. of New York, Albany.
For primary bibliographic entry see Field 02B.
W72-09208

THE DESIGN, CONSTRUCTION, AND USE OF AN ICE CRYSTAL COUNTER FOR ICE CRYSTAL CLOUD STUDIES BY AIRCRAFT,
State Univ. of New York, Albany. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 02B.
W72-09209

LARGE VERTICAL WIND TUNNEL FOR HYDROMETEOR STUDIES,
State Univ. of New York, Albany.
For primary bibliographic entry see Field 02B.
W72-09210

DESIGN, CONSTRUCTION AND TESTING OF THE DROPSONDE,
State Univ. of New York, Albany.
For primary bibliographic entry see Field 02B.
W72-09211

POINT DISCHARGE CURRENT IN BLACKWELL, OKLAHOMA, JUNE 1969 - SEPTEMBER 1970,
State Univ. of New York, Albany.
For primary bibliographic entry see Field 02B.
W72-09218

AIRBORNE AND GROUND MEASUREMENTS OF THE ATMOSPHERIC POTENTIAL GRADIENT DURING A SOLAR ECLIPSE,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
For primary bibliographic entry see Field 02B.
W72-09220

AGE OF THE LAST GLACIAL MAXIMUM IN THE WESTERN DVINA-DNIEPER INTERFLUVE (VOZRAST MAKSIMAL'NOY STADII POSLEDNEGO OLEDENENIYA NA MEZHDURECH'YE ZAPADNOY DVINY I DNEPRA),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 02C.
W72-09255

INFORMATION BULLETIN ON HYDROMETEOROLOGICAL INSTRUMENTS AND INVESTIGATION TECHNIQUES (INFORMATSIONNYYE MATERIALY PO GIDROMETEOROLOGICHESKIM PRIBORAM I METODAM NABLYUDENIY).
Scientific Research Inst. of Hydrometeorological Instruments, Leningrad (USSR).

Gidrometeoizdat, Moscow, Khomenko, Ya. N., editor-in-chief, NIIGMP Collection 46, 1971. 73 p.

Descriptors: *Meteorology, *Hydrometry, *Instrumentation, *Measurement, Flow measurement, Flow rates, Water levels, Discharge (Water), Sediment discharge, Velocity, Depth, Pressure measuring instruments, Moisture meters, Gages, Thermometers, Anemometers, Buoys, Data collections, Patents, Conferences.
Identifiers: *USSR, *Inventions, Psychrometers, Bathometers, Barometers, Barographs.

New instruments and devices are described for measurement of various hydrometeorological and hydrological phenomena, including air temperature, atmospheric pressure, wind movement and direction, humidity, cloudiness, precipitation, stream velocities, and water discharges. Highlights of the Fifth Session of the Commission on Meteorological Instrumentation and Investigation Techniques (Paris, 1969) and of the Instrument Exhibition at the International Symposium on Hydrometry (Koblenz, Germany, 1970) are presented together with research proposals by personnel of the USSR Hydrometeorological Service for improvement of hydrometeorological instruments. References to Soviet inventions are accompanied by brief descriptions of United States and foreign patents and designs. (Josefson-USGS)
W72-09278

DETERMINATION OF THE ZONE OF ORIGIN OF TSUNAMIS (OPREDELENIYE MESTA VOZNIKNOVENIYA TSUNAMI),
For primary bibliographic entry see Field 02L.
W72-09280

RADIOCARBON DATING OF TERRACES OF THE UPPER OB' REGION (ALTAY PIEDMONT PLAIN) (RADIOUGLERODNYYE DATIROVKI TERRAS VERKHNEGO PRIOB'YA (PREDALTAYSKAYA RAVNINA)),
Akademiya Nauk SSSR, Novosibirsk. Institut Geologii i Geofiziki.
For primary bibliographic entry see Field 02J.
W72-09285

IODINE COLORIMETER.
Beckman Instruments, Inc., Fullerton, Calif. Advanced Technology Operations.
For primary bibliographic entry see Field 05A.
W72-09322

A THREE-DIMENSIONAL CURRENT METER FOR ESTUARINE APPLICATIONS,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02L.
W72-09334

ALL COUNT DISTRIBUTIONS ARE NOT ALIKE,
Eastman Kodak Co., Rochester, N.Y.
J. E. Jackson.
Journal of Quality Technology, Vol 4, No 2, p 86-92, April 1972. 4 tab, 15 ref.

Descriptors: *Distribution, *Statistical methods, Quality control, Probability, Mathematical studies.
Identifiers: *Count distribution theory, *Poisson distribution, Pascal distribution, Polya-Eggenberger distribution, Neyman distribution, Short distribution, Mixed Poisson distribution, Zero-truncated distribution, Inflated distribution, Thomas distribution, Branding process, Binomial distribution.

Although the Poisson distribution is probably the most common distribution associated with count (or defects per item) data, it is by no means the only one. Some situations are presented which would lead to other distributions, in particular situations where: (1) defects occur in clusters; (2) defects are the result of two underlying causes; and where (3) probability of no defects is not related to the distribution of counts or the occurrence of no defects cannot be recorded. Distribution techniques discussed for use in these situations include Poisson, mixed Poisson, Polya-Eggenberger, Pascal, Neyman type A, and Thomas distributions as well as the zero-truncated and inflated distributions. Mixtures of discrete distributions, e.g., short distribution are also discussed. (Mackan-Battelle)
W72-09339

A PRACTICAL ON-STREAM PARTICLE SIZE ANALYSIS SYSTEM,
Milltronics Ltd., Peterborough (Ontario).
B. F. Osborne.
ISA Transactions, Vol. 10, No. 4, p 379-385, 1971. 7 fig, 3 ref.

Descriptors: *Automatic control, *Sampling, *Particle size, Water analysis, Instrumentation, Equipment, Suspended solids, Data processing.
Identifiers: Particle size analyzer, Process streams, On-stream analysis, Detectors, Potentiometric sensors.

A continuous on-line particle size analyzer is described as part of an integrated system involving sampling, measuring, and controlling the particle size in a process stream. The size analyzer requires a constant sample flow of about 2.9 U.S. gpm with solids content of between 10 and 30 percent by weight and consists of (1) a slurry flow channel which incorporates a density and particle size measuring section, (2) a radioactive source (strontium)/radiation detector, and (3) a transversing system for the source/detector. The sampling techniques, and subsequent control procedures, are discussed briefly. Typical results obtained on slurries are presented, and their accuracies are assessed according to the precision required for control techniques. Also shown is how the data obtained are processed electronically to obtain a signal, proportional to particle size and suitable for control purposes as well as the use of these signals for process control. (Synder-Battelle)
W72-09372

THE STATISTICS OF SUBSAMPLING,
Scripps Institution of Oceanography, La Jolla, Calif.
E. L. Venrick.
Limnology and Oceanography, Vol 16, No 5, p 811-818, September 1971. 2 fig, 4 tab, 2 ref.

Descriptors: *Sampling, Variability, Population, *Statistical methods, Data processing, Distribution, Analytical techniques.
Identifiers: *Subsamples, *Variance, Counting, Precision, Sample size, Aliquots, Subsampling, Accuracy, Degrees of freedom.

Formulae have been developed which define the variance of data based on the enumeration of subsamples of subsamples. These formulae demonstrate that the proportion of total variance contributed by field variability is dependent on the proportion of the original sample that is enumerated. An IBM 1800 computer was programmed to simulate a series of sampling studies in which degrees of freedom, subsampling ratios, and the field variance of the population were altered. The variability introduced during the subsampling and aliquoting was no greater than random expectation and was approximated by the mean. The distributions sampled by the computer were normal distributions rather than discrete Poisson or contagious distributions encountered in the field. The results showed that the formulae satisfactorily predict observed variance and that precision depends only upon the total degrees of freedom. It appears that the more efficient way to sample in obtaining quantitative field data is to take a large subsample and a small aliquot rather than the reverse. (Holoman-Battelle)
W72-09416

RAPID METHODS FOR MEASURING RAIDOACTIVITY IN THE ENVIRONMENT.
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 05A.
W72-09437

INSTRUMENTATION FOR IN-SITU DETERMINATION OF ICE PARTICLE SIZE DISTRIBUTION,
North American Rockwell Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 03A.
W72-09513

REMOTE SENSING ACQUISITION OF TRACER DYE AND INFRARED IMAGERY INFORMATION AND INTERPRETATION FOR INDUSTRIAL DISCHARGE MANAGEMENT,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05B.
W72-09550

MAPPING BURIED BEDROCK TOPOGRAPHY WITH GRAVITY,
East Texas State Univ., Commerce. Dept. of Earth Sciences.
For primary bibliographic entry see Field 02F.
W72-09618

GROUND-WATER VOLUMES FROM ANOMALOUS MASS DETERMINATIONS FOR ALLUVIAL BASINS,
Arizona Univ., Tucson. Geophysics Lab.
For primary bibliographic entry see Field 02F.
W72-09619

ICE MONITORING EQUIPMENT,
For primary bibliographic entry see Field 02C.
W72-09626

DEVELOPMENT AND TRAIL USE OF ACCEPTANCE SAMPLING PLANS FOR COMPACTED EMBANKMENTS,
North Dakota State Univ., Fargo.
For primary bibliographic entry see Field 08D.
W72-09700

TESTING METHODS FOR CONCRETE DURABILITY,
Norges Tekniske Hoegskole, Trondheim; and Illinois Univ., Chicago.
For primary bibliographic entry see Field 08F.
W72-09702

BEACH WATER TABLE AND BEACH--PROFILE MEASURING EQUIPMENT,
Erindale Coll. (Ontario).
W. Harrison, and J. D. Boon, III.
Shore and Beach, Vol 40, No 1, p 26-33, April 1972. 9 fig, 1 tab, 2 ref. Contracts N00014-70-C-0004 (NR388-097) and DAW-72-69-C-0031.

Descriptors: *Beaches, *Water table, *Topography, *Profiles, *Instrumentation, Surveys, Data collections, Virginia, Measurement, Gages, Monitoring, Surveying instruments, Water levels, Water level fluctuations.
Identifiers: *Beach profiles.

A system for acquiring data on the level of the water table in a sandy beach consists of (1) a 10.16-cm slotted PVC well pipe with nonslotted upper section, housing a float and float wire; (2) a 3.8-cm galvanized steel pipe, housing a counterweight and counterweight line; and (3) a float-gage system consisting of a differential pulley connected to a 10-turn, 5 K-ohm precision potentiometer, both mounted on a covered wooden platform at the top of the pipes some 1 m above the beach surface. Beach-profiling equipment consists of an articulated wooden frame with level bubble and protractor mounted in one corner, that is used in conjunction with a portable tape recorder. It can provide helpful data on storm changes in beaches. (Knapp-USGS)
W72-09758

7C. Evaluation, Processing and Publication

INDEX OF SURFACE-WATER RECORDS TO SEPTEMBER 30, 1970: PART 2.--SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-09224

WATER RESOURCES INVESTIGATIONS IN LOUISIANA, 1968.
Geological Survey, Washington, D.C.

Available free on request to USGS, Washington, D.C. 20242. Geological Survey Report of Investigations Folder, 1 sheet, 1968. 5 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Louisiana, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

Water resources studies and investigations of the U.S. Geological Survey in Louisiana are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 123 primary, secondary, and water management streamflow stations; 598 groundwater observation wells; and 41 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual rainfall, and discharge of principal rivers. A map, scale 28 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Louisiana in September 1968. (Woodard-USGS)
W72-09225

WATER RESOURCES INVESTIGATIONS IN IOWA, 1968.
Geological Survey, Washington, D.C.

Available free on request to USGS, Washington, DC 20242. Geological Survey Report of Investigations Folder, 1 sheet, 1969. 4 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Iowa, *Interagency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, On-site investigations, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

Water resources studies and investigations of the U. S. Geological Survey in Iowa are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 136 primary, secondary, and water management streamflow stations; 125 groundwater observation wells; and 30 water quality observing sites. Small State maps show principal sources of groundwater, normal annual precipitation, average annual runoff, and discharge of the principal rivers. A map, scale 30 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Iowa in October 1968. (Woodard-USGS)
W72-09226

ON THE WATER OF THE CANADIAN ARCTIC ARCHIPELAGO, AN ATLAS PRESENTATION OF 1961 AND 1962 DATA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
F. G. Barber, and A. Huyer.
Manuscript Report Series No 21, 1971. 76 p, 14 fig, 2 tab, 32 ref.

Descriptors: *Oceanography, *Hydrologic data, *Water circulation, *Canada, *Arctic, Surface waters, Data collections, Water temperature, Salinity, Dissolved oxygen, Bays, Freshwater, Heat budget, Saline water-freshwater interfaces.
Identifiers: *Canadian Arctic archipelago, Atlas.

This atlas presentation represents a step in the development of those oceanographic data observed in and near the Canadian Arctic archipelago during the years 1960-62. Presentations of portions of the data include a heat budget for Barrow Strait and a freshwater budget for the Gulf of Boothia. Values were derived from individual station graphs of each variable against depth using available bathythermograph data. The vertical distribution of salinity at about 1150 m and deeper observed in 'Labrador' in 1961 and 1962 shows a small systematic error of about 0.01 between the data of the two years. A feature of most of the shallower presentations is the strong gradient in each distribution across Baffin Bay. The feature appears to be associated with a movement of a relatively low-salinity cold water out of the archipelago and along the east coast of Baffin Island. (Woodard-USGS)
W72-09227

COMPUTER SOFTWARE FOR WASTEWATER TREATMENT PLANT DESIGN,
Monsanto Enviro-Chem Systems Inc., Dayton, Ohio.
For primary bibliographic entry see Field 05D.
W72-09233

BOMEX TEMPORARY ARCHIVE DESCRIPTION OF AVAILABLE DATA,
National Oceanic and Atmospheric Administration, Rockville, Md. Office of Science and Technology.
T. C. de la Moriniere.
Available from GPO, Washington, D.C. 20402, Price - $2.25. Technical Report, EDS 10, January 1972. 304 p, 27 fig, 67 tab.

Descriptors: *Oceanography, *Meteorology, *Data collections, *Ecology, *Environmental gradient, Sampling, Oceans, Aircraft, Islands, Ships, Methodology, Analytical techniques, Monitoring, Data processing, Meteorological data, Climatology, Instrumentation, Radar, Tracking techniques, Winds, Weather patterns.
Identifiers: *Barbados Oceanographic and Meteorological Experiment, Rawinsonde.

Data available from the BOMEX Temporary Archive, a depository for data collected during the Barbados Oceanographic and Meteorological Experiment (BOMEX) during May, June, and July 1969 are described. Procedures used in processing these data, inventories of the archived data, and ordering instructions and costs are given. The temporary archive represents data selected by the Barbados Oceanographic and Meteorological Analysis Project (BOMAP) Office that were acquired from the fixed-ship, aircraft, and island-based acquisition systems under the operational control of the BOMEX Field Headquarters. The temporary archive contains preliminary, un-

validated data that are being made available at an early stage in the BOMAP processing activity. It will be replaced by a permanent archive when the data-processing cycle is finished (late 1972). Validated data are defined as processed data for which the quality has been effectively demonstrated, and limitations as to space resolution, time resolution, and accuracy have been clearly documented. (Woodard-USGS)
W72-09263

AVAILABLE SOIL WATER: TIME-DISTRIBUTION IN A WARM SEASON RANGELAND,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02A.
W72-09271

A HYDROMETEOROLOGICAL DATA APPRAISAL AND DESIGN STUDY IN CERTAIN RIVER BASINS IN THE WESTERN UNITED STATES.
North American Weather Consultants, Goleta, Calif.
For primary bibliographic entry see Field 02B.
W72-09272

A COMPARISON OF STOCHASTIC LINEAR PROGRAMMING AND SIMULATIONS FOR THE EVALUATION OF HYDROLOGIC ECONOMIC RISKS IN WATER RESOURCES SYSTEM DESIGN,
Texas A and M Univ., College Station. Inst. of Statistics.
For primary bibliographic entry see Field 06A.
W72-09293

REPEATABILITY AND REPRODUCIBILITY,
National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
J. Mandel.
Journal of Quality Technology, Vol. 4, No. 2, p 74-85, April 1972. 3 fig, 10 tab, 7 ref.

Descriptors: *Testing, *Quality control, Evaluation, Performance, Correlation analysis, Variability, Mathematical studies, Average, Laboratory tests, Statistical methods, Methodology, Measurement, Estimating.
Identifiers: *Repeatability, *Reproducibility, Analysis of variance, Mean squares, Outliers, Interlaboratory studies, Precision, Statistical analysis.

A simple method for evaluating repeatability and reproducibility obviates such difficulties as transformation of data or weighted analysis of variance. The estimates obtained for the two measures of precision are as good as or better than those of more sophisticated methods of analysis. However, the method does have the shortcoming that these two parameters do not contain all the pertinent information in the interlaboratory test data. The rationale is also discussed for the proper choice of the number of laboratories and replicate measurements required in an interlaboratory study. (Mackan-Battelle)
W72-09310

ON THE USE OF TOLERANCE INTERVALS IN ACCEPTANCE SAMPLING BY ATTRIBUTES,
Jersey Nuclear Co., Richland, Wash.
J. L. Jaech.
Journal of Quality Technology, Vol. 4, No. 2, p 69-73, April 1972. 9 tab, 3 ref.

Descriptors: *Quality control, *Sampling, Statistical methods, Mathematical studies, Evaluation, Probability, Reliability, Data collections.
Identifiers: *Tolerance intervals, Multiple sampling, Acceptance sampling, Attributes.

Sampling cannot be validly extended if the acceptance criterion is not satisfied by the initial single sample when the initial sample size is based on a fixed sample size plan. A type of specification used in acceptance sampling of a lot of items involves the use of tolerance intervals. The producer is required to make the following type of statement about a lot, 'With 100 gamma percent confidence, at least 100P percent of the items in the lot are acceptable, i.e., within specifications'. In this situation, the producer has freedom in selecting his sample size; all he must do is perform sufficient sampling to permit his making the required tolerance interval statement. However, in exercising this freedom, he must use care to properly assess the risk to the consumer if he attempts to meet the specification with a multiple type sampling plan. An evaluation is made of such risk when the inspection is made on the basis of certain attributes. (Mackan-Battelle)
W72-09311

MASS SPECTROMETRIC ISOTOPE RATIO MEASUREMENTS AND PEAK AREA INTEGRATION USING THE PEAK-SWITCHING FEATURE OF THE AEI MS-902,
North Carolina Univ., Chapel Hill. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-09326

GC/MS/COMPUTERS,
Waterloo Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W72-09327

BEST LINEAR UNBIASED ESTIMATES OF THE PARAMETERS OF THE LOGISTIC DISTRIBUTION BASED ON SELECTED ORDER STATISTICS,
University of Western Ontario, London. Dept. of Mathematics.
L. K. Chan, N. N. Chan, and E. R. Mead.
Journal of the American Statistical Association, Vol 66, No 336, p 889-892, December 1971. 14 ref.

Descriptors: *Statistical methods, Mathematical studies, *Quality control, *Estimating equations, *Variability, Testing, Evaluation.
Identifiers: Best linear unbiased estimates, Logistic distribution, *Selected order statistics, Asymptotic joint efficiencies, Asymptotically best linear estimates, Covariance.

Coefficients, variances, and efficiencies are provided for the best linear unbiased estimates (BLUE's) of the mean and standard deviation of the logistic distribution, with both unknown, based on four order statistics with ranks giving the maximum joint efficiency among all BLUE's based on four order statistics. Asymptotic joint efficiencies are compared for asymptotically best linear estimates (ABLE's) based on order statistics with ranks determined by various spacings. With one parameter known, the BLUE's and ABLE's using order statistics with ranks determined by the optimum spacings of the ABLE's, have efficiencies close to those of BLUE's based on optimum ranks. (Mackan-Battelle)
W72-09348

AN ANALYSIS OF VARIANCE FOR CATEGORICAL DATA,
Harvard Univ., Cambridge, Mass. Graduate School of Education.
R. J. Light, and B. H. Margolin.
Journal of the American Statistical Association, Vol 66, No 335, p 534-544, September 1971. 6 tab, 13 ref.

Descriptors: *Statistical methods, *Quality control, Mathematical studies, Equations, Statistics, Statistical models, Sampling.
Identifiers: *Analysis of variance, *Categorical data, *Variance, Empirical sampling, Catanova statistics, Chi-square statistics, Manova statistics, Data analysis, Null hypothesis.

A measure of variation for categorical data is presented in which an analysis of variance is developed for a one-way table, where the response variable is categorical. The data can be viewed alternatively as falling in a two-dimensional contigency table with one margin fixed. Components of variation are derived, and their properties are investigated under a common multinomial model. Using these components, a measure of the variation in the response variable explained by the grouping variable is proposed. A test statistic is constructed on the basis of these properties, and its asymptotic behavior under the null hypothesis of independence is studied. Empirical sampling results confirming the asymptotic behavior and investigating power are included. (Mackan-Battelle)
W72-09357

ON BIAS REDUCTION IN ESTIMATION,
Southern Methodist Univ., Dallas, Tex. Statistics Lab.
W. R. Schucany, H. L. Gray, and D. B. Owen.
Journal of the American Statistical Association, Vol 66, No 335, p 524-533, September 1971. 18 ref.

Descriptors: *Statistical methods, *Quality control, *Estimating equations, Mathematical studies, Reliability.
Identifiers: Errors, Point estimators, Jackknife technique, Accuracy, Truncation point, *Bias reduction, Statistical distributions.

A general procedure for reducing the bias of point estimators is introduced. The technique includes the 'jackknife' as a special case. The existing notion of reapplication is shown to lack a desirable bias removal property for which it was originally designed. Proper reapplication is proposed to conform to the general notion of higher order bias elimination and an algorithm for the correct method is defined. Illustrative examples are drawn from ratio estimation, reliability, and truncated distributions. The reduced mean square error which attracted some attention to the jackknife is present in the generalization for some applications. (Mackan-Battelle)
W72-09358

DATA ON SAMPLES FOR SURF CLAMS AND OCEAN QUAHOGS,
National Marine Fisheries Service, Washington, D.C.
J. W. Ropes, and A. S. Merrill.
Available from the National Technical Information Service as COM 71-00639, $3.00 in paper copy, $0.95 in microfiche. Data Report 57, February 1971. 45 p, 16 tab, 3 ref. 7931400.

Descriptors: *Clams, *Bottom sampling, *Continental shelf, Distribution, Marine biology, Fisheries, Shellfish, Atlantic Ocean.
Identifiers: *Quahogs, Seafood, Spisula spp., Actica spp., Surf clams.

Data on the catch of surf clams and ocean quahogs by several research vessels, operating in the continental shelf of the Gulf of Maine to Cape Hatteras, North Carolina, are presented. (Svensson-Washington)
W72-09521

WATER RESOURCES INVESTIGATIONS IN MISSISSIPPI, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 5 fig, 1 map.

Descriptors: Water resources, Investigations, *Mississippi, *Inter-agency cooperation, Runoff, *Surveys, Planning, *Hydrologic data, Basic data collections, Streamflow, Water temperature, On-site investigations, Water quality, Water level fluctuations, Bibliographies, Networks, *Maps.
Identifiers: Cooperative water-studies program, Research projects.

Water resources studies and investigations of the U.S. Geological Survey in Mississippi are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 66 primary, secondary, and water management streamflow stations; 57 groundwater observation wells; and 4 water quality observing sites. Small State maps show principal sources of groundwater, mean annual precipitation, average annual runoff, and discharge of the principal rivers. A map, scale 47 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Mississippi in January 1969. (Woodard-USGS)
W72-09534

WATER RESOURCES INVESTIGATIONS IN MONTANA, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 7 fig, 1 map.

Descriptors: Water resources, Investigations, *Montana, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, *Surveys, Planning, Hydrologic data, *Basic data collections, Streamflow, Water temperature, Sediment transport, On-site investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, *Maps.
Identifiers: Cooperative water-studies program, Research projects.

Water resources studies and investigations of the U.S. Geological Survey in Montana are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 190 primary, secondary, and water management streamflow stations; 160 groundwater observation wells; and 53 water quality observing sites. Small State maps show principal sources of groundwater, mean annual precipitation, average annual runoff, discharge of the principal rivers, and the quality of surface waters. A map, scale 50 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Montana in May 1969. (Woodard-USGS)
W72-09535

WATER RESOURCES INVESTIGATIONS IN KANSAS, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 7 fig, 1 map.

Descriptors: Water resources, Investigations, *Kansas, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, *Surveys, Planning, Hydrologic data, *Basic data collections, Streamflow, Sediment transport, On-stie investigations, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, *Maps.
Identifiers: Cooperative water-studies program, Research projects.

Water resources studies and investigations of the U.S. Geological Survey in Kansas are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 177 primary, secondary, and water management streamflow stations; 857 groundwater observation wells; and 83 water quality observing sites. Small State maps show principal sources of groundwater, mean annual precipitation, mean annual runoff, mean annual sediment yields of streams, discharge of principal rivers, and the dissolved solids in streams. A map, scale 45 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Kansas in December 1968. (Woodard-USGS)
W72-09536

AN INVENTORY OF PUBLISHED AND UNPUBLISHED FLUVIAL-SEDIMENT DATA FOR CALIFORNIA, 1956-70,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W72-09542

ELECTRICAL ANALOG MODEL STUDY OF WATER IN GUAYAMA AREA, PUERTO RICO: PHASE 1 -- ASSEMBLING DATA FOR THE ANALOG MODEL,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 02F.
W72-09543

A COMPARISON OF MASS-TRANSFER AND CLIMATIC-INDEX EVAPORATION COMPUTATIONS FROM SMALL RESERVOIRS IN TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02H.
W72-09555

WATER SUPPLIES AND THE LAND--THE ELKHORN RIVER BASIN OF NEBRASKA,
Geological Survey, Lincoln, Nebr.
R. Bentall.
Nebraska University Conservation and Survey Division Resource Atlas No 1, December 1971. 51 p.

Descriptors: Water resources development, *Hydrologic data, *Hydrology, *Nebraska, *Data collections, Surface waters, Groundwater, Water supply, Water yield, Precipitation (Atmospheric), Runoff, Groundwater recharge, Water users, Water quality, Streamflow, River basins, Sediment transport, Water properties, Water analysis, Hydrogeology, Hydrologic cycle, Water temperature, Agriculture, Water wells, Irrigation, Hydrologic budget.
Identifiers: *Elkhorn River basin (Neb).

This hydrologic atlas, which is compiled in booklet form, presents information that is pertinent to water-supply development in the part of Nebraska drained by the Elkhorn River. Illustrations using landscape and climatic data show how much precipitation returns to the atmosphere, how much becomes overland runoff to streams, and how much reaches streams by subterranean percolation. Information is included on infiltration rates and water-holding capacities of soils; on the areal distribution and thickness of rocks capable and not capable of yielding water to wells; on the variability, chemical quality, and sediment-transporting capacity of streams; and on the availability of groundwater and its chemical characteristics. (Woodard-USGS)
W72-09557

GROUND-WATER LEVELS IN THE LOWER ARKANSAS RIVER VALLEY OF COLORADO, 1968-72.
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W72-09559

A METHOD FOR PREDICTING THE PERFORMANCE OF NATURAL DRAFT COOLING TOWERS.
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05D.
W72-09726

MATHEMATICAL MODELS FOR THE PREDICTION OF THERMAL ENERGY CHANGES IN IMPOUNDMENTS.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 05B.
W72-09727

NUMERICAL METHODS FOR DETERMINING STREAMLINES AND ISOPRESSURES FOR USE IN FLUID-FLOW STUDIES,
San Francisco Energy Research Lab., Calif.
For primary bibliographic entry see Field 02F.
W72-09754

WATER TEMPERATURES OF CALIFORNIA STREAMS, SOUTH COASTAL SUBREGION,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02E.
W72-09755

ON THE CLASSIFICATION AND TRENDS OF LONG PERIOD SEA LEVEL SERIES,
National Ocean Survey, Rockville, Md.
S. D. Hicks.
Shore and Beach, Vol 40, No 1, p 20-23, April 1972. 10 fig, 1 tab, 4 ref.

Descriptors: *Sea level, *Water levels, *Coasts, *United States, Data collections, Time series analysis, Regression analysis, Continental margin.
Identifiers: Sea level changes.

The most recent yearly mean sea level data available are presented in graphic form. Apparent secular trend calculations are given for the 31-year series, 1940 to 1970, at all stations. The monitoring is accomplished with continuously recording analog tide gages at 115 station locations. A constriction at the bottom of each tide gage float well restricts the flow in and out of the well to the extent that wind waves are effectively damped. Hourly heights are obtained from the recordings and averaged for yearly mean sea level values at each station. Apparent secular trends were determined by computing the slope of a least-squares line of regression for the common 1940 to 1970 series at each station. (Knapp-USGS)
W72-09757

WATER RESOURCES OF CLAY, GREENE, CRAIGHEAD, AND POINSETT COUNTIES, ARKANSAS,
Geological Survey, Washington, D.C.
M. S. Hines, R. O. Plebuch, and A. G. Lamonds.
Available from USGS, Washington, DC 20242 Price $1.50 per set. Geological Survey Hydrologic Investigations Atlas HA-377, 1972. 2 sheets, 8 fig, 11 map, 7 tab, 27 ref.

Descriptors: *Water resources, *Hydrologic data, *Surface waters, *Groundwater, *Arkansas, Water supply, Water quality, Water users, Water yield, Streamflow, Aquifers, Water wells, Hydrogeology, Irrigation, Basic data collections, Chemical analysis.
Identifiers: *Clay County (Ark), *Greene County (Ark), *Craighead County (Ark), *Poinsett County (Ark).

Fourteen illustrations and tables in this 2-sheet hydrologic atlas describe the water resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas. The occurrence, quantity, availability, and quality of ground and surface water and the variability in these supplies are determined. In addition, water problems peculiar to the area are defined and corrective measures suggested. Average annual streamflow ranges from 1.2 cfs per sq mi in the western part of the four counties to 1.4 cfs per sq mi in the eastern part. Average annual precipitation is about 48 inches. Use of water for agriculture greatly exceeds all other uses combined. In 1965, 111.4 mgd was used for rice irrigation, and 71.5 mgd was used for irrigation of other

crops. An additional 16.9 mgd was used by industry, municipalities, and others. Of these amounts, 180.1 mgd was groundwater and 19.7 mgd was surface water, or a total of 199.8 mgd. (Woodard-USGS)
W72-09764

ANALYSIS OF THE GROUND-WATER SYSTEM BY ELECTRICAL-ANALOG MODEL, AVRA VALLEY, PIMA AND PINAL COUNTIES, ARIZONA,
Geological Survey, Washington, D.C.
O. Moosburner.
Available from USGS, Washington, DC 20242, Price $1.00 per set. Geological Survey Hydrologic Investigations Atlas HA-215, 1972. 2 sheets, 4 fig, 2 map, 3 ref.

Descriptors: *Hydrogeology, *Groundwater, *Water levels, *Analog models, *Arizona, Forecasting, Systems analysis, Input-output analysis, Water level fluctuations, Water wells, Aquifers, Pumping, Groundwater movement.
Identifiers: *Avra Valley (Ariz), Groundwater hydrology, Water-level declines, Static-water levels.

An electrical-analog model was used as a working-scale model of the groundwater system in Avra Valley, Arizona. Illustrations on a 2-sheet Hydrologic atlas include: (1) Groundwater System in 1940 and Pattern of Regional transmissivity, 1940-65; (2) measured and simulated water-level changes, 1940-65; (3) predicted water-level declines, 1965-85; and (4) predicted depth to water in 1985. The predicted depth to water in Avra Valley in 1985 will range from 100 to more than 450 feet below the land surface; in most of the valley, however, the depth to water will range from 300 to 450 feet. The greatest depths to water will be in the central and southeastern parts of the valley. Near Three Points and Rillito, the depth to water will be less than 300 feet below the land surface. The depth-to-water data are for static water levels. (Woodard-USGS)
W72-09765

WATER RESOURCES INVESTIGATIONS IN MISSOURI, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1968. 8 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Missouri, *Inter-agency cooperation, Runoff, Precipitation (Atmospheric), Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, On-site investigations, Water temperatures, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Missouri are described. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 156 primary, secondary, and water management streamflow stations; 117 groundwater observation wells; and 51 water quality observing sites. Small State maps show principal sources of groundwater, mean annual precipitation, average annual runoff, discharge of the principal rivers, and the water quality in ground and surface waters. A map, scale 50 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Missouri in September 1968. (Woodard-USGS)
W72-09766

WATER RESOURCES INVESTIGATIONS IN NEW JERSEY, 1968.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *New Jersey, *Inter-agency cooperation, Runoff, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, On-site investigations, Water temperatures, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in New Jersey are described. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 97 primary, secondary, and water management streamflow stations; 180 groundwater observation wells; and 62 water quality observing sites. Small State maps show principal sources of groundwater, average annual runoff, sediment yield of streams, discharge of the principal rivers, and the dissolved solids in surface waters. A larger map shows by symbols, numbers, and colored outline the hydrologic data network and investigations in New Jersey in September 1968. (Woodard-USGS)
W72-09767

WATER RESOURCES INVESTIGATIONS IN MINNESOTA, 1969.
Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Minnesota, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Minnesota are described. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 176 primary, secondary, and water management streamflow and gage stations; 59 groundwater observation wells; and 48 water quality observing sites. Small State maps show principal sources of groundwater, annual normal precipitation, average annual runoff, discharge of the principal rivers, and the dissolved solids in groundwater. A map, scale 50 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Minnesota in January 1969. (Woodard-USGS)
W72-09768

WATER QUALITY RECORDS OF THE SNOWY MOUNTAINS REGION, AUSTRALIA.
Snowy Mountains Hydro-Electric Authority, Cooma (Australia).

Data Report, July 1971. 274 p.

Descriptors: *Water quality, *Chemical analysis, *Surface waters, *Water analysis, *Australia, Data collections, Mountains, Water chemistry, Streams, Reservoirs, Water properties.
Identifiers: *Australia (Snowy Mountains Region).

Chemical and physical analyses of water samples collected by the Hydro-Electric Authority in the Snowy Mountains, Australia, and adjacent regions during the period from 1951 to 1968 are presented. The publication is divided into two parts: part 1, containing explanatory notes on the records; and part 2, containing the records arranged in alphabetical order within the Murrumbidgee River basin, Upper Murray River basin, and Snowy River basin. The records for each station are presented in two forms: (1) a summary sheet which includes geographical data, a history of the station, and a summary of its records in which the number of samples, and the mean, maximum and minimum value of each property are given; and (2) detailed sheets which follow the summary sheet and include the results of the tests on the individual samples. (Woodard-USGS)
W72-09770

CATALOGUE OF METEOROLOGICAL DATA OF THE SNOWY MOUNTAINS REGION, AUSTRALIA.
Snowy Mountains Hydro-Electric Authority, Cooma (Australia).

Data Report, October 1970. 106 p.

Descriptors: *Meteorological data, *Basic data collections, *Precipitation (Atmospheric), *Australia, Mountains, Precipitation gages, Snow cover, Density, Moisture content, Sampling, Methodology, Humidity, Winds, Evaporation, Temperature, Solar radiation.
Identifiers: *Australia (Snowy Mountains Region).

The meteorological data which have been collected by the Hydro-Electric Authority in the Snowy Mountains, Australia, and adjacent regions since records commenced on 1 January 1951 are presented. Records collected by other organizations are not included but reference is made to them. The publication is divided into three parts: (1) the introduction; (2) the catalogue; and (3) samples of the charts and forms. Locations at which records have been collected are listed in alphabetical order with the exception of locations at which the only instrument was a nonrecording rain gage. The data (including those from nonrecording rain gages) which are available on various meteorological elements are summarized. (Woodard-USGS)
W72-09771

08. ENGINEERING WORKS

8A. Structures

INTERCEPTOR DRAIN RECOVERY OF CANAL SEEPAGE,
Agricultural Research Service, Brawley, Calif.; and Imperial Irrigation District, Calif.; and Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
L. S. Willardson, A. J. Boles, and H. Bouwer.
Transactions, American Society of Agricultural Engineers, Vol 14, No 4, p 738-741, July-August 1971. 2 fig, 5 tab, 6 ref.

Descriptors: *Subsurface drains, *Canal seepage, *Analog models, Drains, Subsurface drainage, Water loss, On-site investigations, Laboratory tests, Base flow, Flow measurement, Groundwater, Canal design, Canals.
Identifiers: *Water recovery, Imperial Irrigation District (Calif), Open drains, Seepage losses, Drain spacing.

Canal seepage is a problem throughout the world. Because canal lining is not economically feasible for all canals, alternatives must be sought to avoid some seepage problems. One alternative is the installation of interceptor drains near the canal to recover and pump seepage water back into the canal. Water recovery would alleviate water loss and high water tables. Field and laboratory in-

vestigations were conducted on the East Highline Canal, Imperial Irrigation District, Calif, to develop design criteria for interceptor drains adjacent to canals. A 14-in.-dia concrete pilot seepage interceptor drain, 2550 ft long, was installed 9 ft deep and 104 ft from the canal centerline. The drain discharge is approximately 3 cfs but varies with the canal water level. Readings of drain discharge vs. canal water surface elevation, water table levels, and piezometer water levels, were taken over a period of time. These data were used to model the ground-water system on an electric analog. Data from the analog indicate that drains should be as deep and as far from the canal as practicable. Reducing drain inflow resistance improves the efficiency of water recovery, indicating the need for well-designed drain envelopes. (USBR)
W72-09197

COMPARISON OF COMPUTED AND MEASURED DYNAMIC RESPONSE OF MONTICELLO DAM,
Bureau of Reclamation, Denver, Colo.
L. H. Roehm.
Bureau of Reclamation Report REC-ERC-71-45, Dec 1971. 11 p, 6 fig, 1 photo, 3 tab, 14 ref.

Descriptors: *Concrete dams, *Seismic design, *Frequency, *Resonance, Structural behavior, *Arch dams, Earthquake engineering, Matrix methods (Structural), Structural analysis, On-site tests, Deflection, Test results.
Identifiers: Monticello Dam (Calif), Morrow Point Dam (Colo), Mode, *Dynamic response, Natural frequency, Hydrodynamic pressure, Damping, Forced vibration, Vibration tests, Earthquake loads, Dynamic loads.

Forced vibration tests on the 304-ft-high concrete arch Monticello Dam were made to obtain natural frequencies, mode shapes, and damping ratios for the structure. An analytical method was used to compute values for natural frequencies and mode shapes for comparison with the experimental data. Crest deflections determined from accelerations measured during the tests are compared with computed deflections. Results indicate: (1) satisfactory agreement between measured and computed natural frequencies, (2) good agreement between measured and computed mode shapes except for the tangential direction for the fourth mode, (3) good agreement between measured and computed maximum deflections when the hydrodynamic pressure was considered, but poor agreement when no hydrodynamic pressure was included, and (4) earthquake loadings for arch dams can be obtained by the analytical method where the loadings include effects of structural resonance. (USBR)
W72-09198

THE FOUNTAINS OF ROME,
H. V. Morton.
MacMillan Company, New York, N Y, 1966. 302 p.

Descriptors: *Aqueducts, *History, *Europe, *Water supply development, Water sources, Engineering structures, Design, Springs, Lakes, Closed conduits, Aesthetics, Community development, Water management (Applied), Hydraulic engineering.
Identifiers: *Rome, Fountains, Ancient water systems.

A well documented account is given of the intriguing history of Roman aqueducts and their principal fountains. The book is illustrated with 49 color plates, many black and white photographs, several sketches and maps showing routes of the 11 ancient and the 6 modern aqueducts of Rome, and a street map showing fountain sites and other historical places. Water sources for the monumental fountains and domestic needs are in the springs and lakes and rivers several miles away along the aqueducts. The present water system is a reproduction of that of classical Rome. This is partly deliberate and partly inevitable and began when the Renaissance and post-Renaissance popes restored 3 of the ruined aqueducts. By sending large streams of water to certain areas, the same hydraulic problems were created as those existing when the aqueducts were first built from 312 B.C. to A.D. 226. Galen, the Greek doctor, in A.D. 164 wrote: 'None (of the fountains) emits water that is foul, mineralized, turbid, hard, or cold'. When the Goths sacked Rome in A.D. 410 the 11 aqueducts were feeding 1,212 public fountains, 11 imperial thermae, and 926 public baths. Methods used by the Romans to control and circulate the large volume of water that flowed into the city day and night became a mystery for a thousand years after the systems were destroyed. The book also discusses the artists and builders, beginning with the greatest, Marcus Agrippa, who built 500 fountains in one year. (Lang-USGS)
W72-09380

INTEROCEANIC CANAL STUDIES, 1970.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.

Available from NTIS as TID-25722; $12.00 papercopy, $0.95 microfiche. Report TID-25722, December 1, 1970, 1,047p.

Descriptors: *Feasibility studies, *Panama Canal, *Canal construction, *Engineering structures, *Navigation, Excavation, Nuclear explosions, Environment, Public health, Safety evaluation, Ecology, Economic justification.
Identifiers: Conventional explosions.

The Atlantic-Pacific Interoceanic Canal Study Commission was established to determine the feasibility of, and the most suitable site for, the construction of a sea level canal connecting the Atlantic and Pacific Oceans; the best means of constructing such a canal, whether by conventional or nuclear excavation; and the estimated cost thereof. The Commission also evaluated the merits of improving and augmenting the existing Panama Canal to accommodate forecast traffic. The principal conclusions of the study were that: nuclear excavation technology is not yet sufficiently advanced to be considered feasible or safe for canal construction; construction by conventional excavation methods is physically feasible; the most suitable site for such a canal is on Route 10 in the Republic of Panama; and the cost would be $2.88 billion at 1970 price levels. It is recommended that the U.S. negotiate a treaty with Panama to provide for a unified canal system comprising both the existing canal and a sea level canal on Route 10, to be operated and defended under effective control of the U.S. with participation by Panama, and that, if the treaty is negotiated and funds are available, construction of this canal system should be initiated in the 1980's. (See also W72-0931 thru W72-09436) (Houser-ORNL)
W72-09430

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 1-4.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.

Available from NTIS as TID-25715, Vol. 1; $3.00 papercopy, $0.95 microfiche. Report TID-25715, Vol. 1, December 1970, 253p.

Descriptors: *Engineering structures, *Canal construction, Conveyance structures, *Panama Canal, *Nuclear explosions, Excavation, Nuclear engineering, Hydraulic structures, Atlantic Ocean, Pacific Ocean, Geology, Hydrology, Feasibility studies, Economics, Cost-Benefit analysis, Ecology, Water pollution, Public health.
Identifiers: Conventional explosives, Nuclear detonations.

Four appendixes of information related to studies of the engineering feasibility of constructing an Atlantic-Pacific interoceanic canal are presented. The first describes the climate, terrain, geology, and state of development of sites considered as possible routes for either lock or sea level canal construction. The second and third discuss the present state of the art of excavation by conventional and nuclear methods. The final appendix presents information on the management, organization, and funding of the inter-oceanic canal project. The evaluation of the current study and the methods used to determine the most feasible canal routes are outlined and, finally, each of these alternative routes is described in terms of geographical location, climate, terrain, geology, population, and state of development. (See also W72-09430) (Houser-ORNL)
W72-09431

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 5-8.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.

Available from NTIS as TID-25715, Vol. 2; $3.00 papercopy, $0.95 microfiche. Report TID-25715, Vol. 2, December 1970, 222p.

Descriptors: *Engineering structures, *Canal construction, *Conveyance structures, *Panama Canal, Atlantic Ocean, Pacific Ocean, Environment, Hydrologic aspects, Hydrologic systems, Fluid mechanics, Water types, Density, Tides, Tidal effects, Ocean currents, Sea level, Estuaries.
Identifiers: Tidal regimen, Current phenomena.

The state of the art for determining the effects of the tidal and hydrologic environment on a sea level canal across the American Isthmus is presented. The construction of a sea level canal across the American Isthmus would connect two bodies of water with widely varying tidal characteristics. Periodic changes in water levels at the canal extremities would generate currents varying with time in both magnitude and direction. The difference in mean sea levels between the oceans would result in a net transfer of water from the Pacific Ocean to the Atlantic Ocean. Freshwater inflow from intercepted streams would have a tendency to flow over the salt water in the canal and cause density currents. The tidal hydraulics and freshwater inflow are discussed from the general standpoint for sea level canals in the isthmian area. Problems associated with particular routes and their solutions are discussed in separate route appendixes. (See also W72-09430) (Houser-ORNL)
W72-09432

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 9-11.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.

Available from NTIS as TID-25715, Vol. 3, $3.00 papercopy, $0.95 microfiche. Report TID-25715 Vol. 3, December 1970, 299 p.

Descriptors: *Panama Canal, *Engineering structures, *Conveyance Structures, *Hydraulic structures, *Gates, *Locks, Siphons, Canal design, Drains, Navigation, Safety factors, Check structures, Diversion structures, Construction costs, Operating costs, Maintenance costs.

A conceptual evaluation of a lock canal is presented to establish a standard against which the various sea level alternatives can be measured. The lock canal should be capable of transiting vessels up to 150,000 dwt and attaining an annual capacity of 35,000 transits. The potential capacity of the existing canal and its water supply are examined. A conceptual plan of improvement is developed which combines the best features of plans considered in prior studies. A lane of new large locks would be provided to supplement the

capacity of the existing canal. A detailed analysis of the large locks is presented. Methods of augmenting the water supply and a plan of pumping water into Gatun Lake are examined. (See also W72-09430) (Houser-ORNL)
W72-09433

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 12-14.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.

Available from NTIS as TID-25715, Vol. 4; $6.00, papercopy, $0.95 microfiche. Report TID-25715, Vol. 4, December 1970, 352p.

Descriptors: *Panama Canal, *Engineering structures, *Conveyance structures, Navigation, Canal design, Safety, Public health, Environment, Ecology, Soil contamination, Water pollution, Nuclear engineering, Excavation, Hydraulics, Benefit-cost analysis.
Identifiers: Conventional explosives.

The engineering feasibility of constructing a sea level Atlantic Ocean to Pacific Ocean canal is presented in three separate appendixes. The first evaluates canal construction along Route 17 in the Darien Provice of eastern Panama. The second examines the use of combined conventional and nuclear methods for constructing a sea level canal along Route 25 across the American Isthmus in northern Colombia. The last deals with Route 23 which runs between Miguel Bay on Panama's Pacific Coast and Candelaria Bay on the Atlantic Coast of Colombia. Each route study estimates the effects of the effects of the proposed canal construction on the surrounding environment, the safety of the excavation methods considered, the time schedule required, and the cost. Discussed are the many aspects of engineering, economics, environmental effects, and benefit vs. risk considerations. (See also W72-09430) (Houser-ORNL)
W72-09434

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 15-16,
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.

Available from NTIS as TID-25715, Vol. 5; $3.00, papercopy, $0.95 microfiche. Report TID-25715, Vol. 5, December 1970, 312p.

Descriptors: *Panama Canal, *Engineering structures, *Navigation, *Safety, *Public health, Environment, Aquatic environment, Environmental control, Ecology, Marine biology, Aquatic life, Cost-benefit analysis, Feasibility studies, Economics.

The Atlantic-Pacific Interoceanic Canal Study Commission was established to determine the engineering feasibility of constructing a sea level canal by either conventional or nuclear methods across the American Isthmus, to ascertain the most suitable site for such a canal, and to estimate its cost. The organization and cost of this 8-year study are discussed in detail. A separate appendix examines the ecological issues implicit in the construction of such a canal with specific reference to the marine environment, and outlines a research program for assessing the ecological impact of a canal and for minimizing the damage which might occur. The results of the study and its costs are outlined and compared with the goals assigned, and the factors which bear on successful performance of such an undertaking are discussed. (See also W72-09430) (Houser-ORNL)
W72-09435

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIX 17. A BIBLIOGRAPHY.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.

Available from NTIS as TID-25715, Vol. 6; $3.00, papercopy, $0.95 microfiche. Report TID-25715, Vol. 6, December 1970, 203p.

Descriptors: *Bibliographies, *Documentation, *Abstracts, *Information retrieval, *Libraries, *Panama Canal, Engineering structures, Navigation, Public health, Environment, Ecology, Feasibility studies.

A 99-page bibliography is presented of references published prior to Nov. 1970 which are pertinent to the study of the engineering feasibility of constructing an Atlantic-Pacific interoceanic canal across the American Isthmus. A subject index, keyword list, and two code lists are included with the bibliography for ease in document search and identification. The document is an alphabetical subject index of titles with an alphabetical keyword list. Depositories for the availability of documents are listed. (See also W72-09430) (Houser-ORNL)
W72-09436

BEAR CREEK DAM AND LAKE, COLORADO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineers District, Omaha, Neb.

Available from the National Technical Information Service as PB-202 293D, $3.00 in paper copy, $0.95 in microfiche. June 1971. 19 p, 7 tab.

Descriptors: *Colorado, *Environmental effects, *Flood protection, *Decision making, *Administration, Economic justification, Administrative decisions, Adoption of practices, Environmental control, Balance of nature, Flood routing, Flood plain zoning, Water resources development, Conservation, Natural resources.
Identifiers: *Environmental Impact Statements, Flood Control Act of 1968, Bear Creek (Colo).

The project was authorized by the Flood Control Act of 1968 and would consist of a dam and multiple-purpose reservoir on Bear Creek (Colorado) for flood control, general recreation, and fish and wildlife enhancement. Environmental impacts will include: (1) the development of flood control, (2) the establishment of specific recreation sites and facilities, and (3) the possibility for establishment of a managed, cold-water trout fishery. Detrimental aspects include relocation or termination of certain business, industrial, and agricultural operations, loss of approximately 1.5 miles of mountain stream, increased urban encroachment on the flood plain, loss of some vegetation, and some adverse effect on recreation in the area. Remedial, protective, and mitigative measures include relocations, replacement of lost vegetation, comprehensive flood plain zoning, and the planting of turf grass in areas of heavy public use. No feasible alternative is seen to the proposed action. A number of irreversible commitments of resources such as land, sand, gravel, labor and materials, and 1.5 miles of stream would be involved in the proposed action should it be implemented. Attached are extracts from the General Design Memorandum presenting economic data for the project. (Widman-Florida)
W72-09474

TALLULAH CREEK WATERSHED (LONG CREEK PORTION), NORTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-204 457D, $3.00 in paper copy, $0.95 in microfiche. November 23, 1971. 19 p, 1 map.

Descriptors: *Environmental effects, *Flood protection, *Watersheds (Basins), *Water supply development, *North Carolina, Water supply, Land management, Floods, Flood control, Flood damage, Flood plains, Floodwater, Structures, Economics, Agriculture, Sediments, Erosion, Fisheries, Aquatic habitats, Storms, Employment opportunities, Recreation, Detention reservoirs, Forests, Project benefits.
Identifiers: *Environmental Impact Statements, *Tallulah Creek (N.C.).

This watershed project consists of one multiple-purpose structure for municipal water storage, flood prevention, and land treatment. The watershed covers primarily forest land, but other land is devoted to crops, grassland, and urban use. Small crop damaging floods occur as often as once a year. Larger, less frequent floods cause extensive damage. Increased income to residents, water for municipal and industrial use, fishery habitat, recreation, and new jobs will be provided by the project. It will also reduce soil erosion, sediment, and floodwater damage from storms. Land removed from production, destruction of a trout stream segment, and limited use of land in the detention pool are the project's adverse effects. Purchase of the flood plain and flood proofing fixed improvements were deemed economically and socially undesirable alternatives. A single-purpose structure and channel improvement with a multiple-purpose structure were rejected as economically unfeasible. Other water supply sources were not accessible. No action would have detrimental social and economic effects. The project is compatible with long-term use of natural resources. Land and a portion of a trout stream will be irreversibly committed. (Ilkson-Florida)
W72-09475

CONCRETE BLOCKS FOR EARTH SLOPE PROTECTION,
For primary bibliographic entry see Field 04A.
W72-09705

8B. Hydraulics

SELECTIVE WITHDRAWAL STUDIES FOR THE FISH HATCHERY OUTLETS AT PUEBLO DAM--MATHEMATICAL AND PHYSICAL MODELS,
Bureau of Reclamation, Denver, Colo.
D. L. King.
Bureau of Reclamation Report REC-ERC-71-32, Aug 1971. 18 p, 32 fig, 2 tab, 2 ref.

Descriptors: *Reservoirs, *Hydraulic models, *Thermal stratification, *Mathematical studies, *Mathematical models, Density currents, Water quality, Hydraulics, Stratification, Stratified flow, Outlets, Simulation, Fish hatcheries, Water temperature.
Identifiers: Pueblo Dam (Colo), *Selective level releases, *Multilevel outlets.

Mathematical and physical models were used to evaluate the design of a proposed selective withdrawal outlet system for a fish hatchery downstream from Pueblo Dam, Colo. The mathematical model predicted that the reservoir would be stratified during a few months in the spring but would be isothermal during the summer and fall. Effects of an existing barrier dam were estimated by mathematical and physical models. Stratification patterns upstream from the barrier, predicted by the mathematical model, were used in a 1:60 hydraulic model to study conditions downstream from the barrier. The barrier acted as a skimmer, causing the flow of warmer water from higher levels in the reservoir to enter the region downstream from the barrier. The river outlets and municipal outlet operation in drawing down the isotherms caused warmer temperatures of withdrawal at the hatchery outlets. A higher hatchery outlet was recommended, in addition to the 3 hatchery outlets included in the preliminary design. (USBR)
W72-09194

ASYMPTOTIC THEORY OF HELICAL WAVES ON A GASEOUS JET IN A ROTATING VISCOUS FLUID,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02E.
W72-09237

STREAM TURBULENCE EFFECTS ON TURBULENT BOUNDARY LAYER,
Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
For primary bibliographic entry see Field 02E.
W72-09257

INITIATION OF RIPPLES BY ARTIFICIAL DISTURBANCES,
Bechtel Corp., San Francisco, Calif. Slurry Pipeline Development.
For primary bibliographic entry see Field 02J.
W72-09260

THEORETICAL ANALYSIS OF FLOW PAST LEAF GATE,
Manchester Univ. (England). Dept. of Civil Engineering.
R. Narayanan.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY6, Paper 8942, p 993-1011, June 1972. 19 fig, 9 ref, append.

Descriptors: *Flow around objects, *Hydraulic gates, Slide gates, Stop logs, Hydraulic jump, Turbulent flow, Jets, Hydraulic models, Model studies.
Identifiers: *Leaf gates.

A theoretical method was developed to predict the mean flow of a two-dimensional turbulent jet spreading in a duct of constant width. The mean velocity distribution in the zone of recirculation is idealized. Integral momentum equations in conjunction with the integral continuity equation are used to calculate the streamwise variations of the mean pressure and three parameters characterizing the mean velocity profile. The theoretical model of the confined jet is then applied to the reattaching flow past vertical plates of moderate height to determine the streamwise distribution of static pressure. For plates of heights comparable to the depth of the duct, the flow is represented as a plane turbulent wall jet spreading in a duct. The theory predicts satisfactorily the point of separation of the boundary layer from the top wall observed in experiments. (Knapp-USGS)
W72-09274

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 5-8.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09432

THE APPROXIMATE THEORIES OF PNEUMATIC WAVE GENERATORS,
Army Engineer, Waterways Experiment Station, Vicksburg, Miss.
G. H. Keulegan.
Available from NTIS, Springfield, Va. 22151 as AD-733 776-Price $3.00 paper copy; $0.95 microfiche. Research Report No 2-7, April 1966. 100 p, 18 fig, 8 tab, 9 ref.

Descriptors: *Waves (Water), *Tsunamis, *Model studies, *Hawaii, *Ocean waves, Bays, Harbors, Hydraulic models, Pressure head, Air-water interfaces, Theoretical analysis, Equations.
Identifiers: *Pneumatic wave generators.

Procedures for the design of a pneumatic generator for long waves are outlined and are applied for the generator used in the Hilo Harbor, Hawaii, model used to study the problems of protection against tsunamis. Emphasis is on the required pressure condition for the genesis of long surges with constant wave heights. From the energy point of view, the sum of the pressure head in the pneumatic chamber and the water elevation therein should remain constant during the issuance of the wave from the generator. This condition would be realized for the operation where, subsequent to the raising of water into the chamber, the outside air is allowed to enter the chamber through an aperture. Because of the inertia of water, marked pressure oscillations occur in the chamber at the instant of aperture opening. These oscillations last for a short time, and the fall of water surface and the increase of pressure become uniform. (Woodard-USGS)
W72-09541

SELECTION OF SCALE FOR RIPRAP MODEL OF IN-SHORE HARBOR, SITE X. ANALYTICAL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
A. M. Kamel.
Available from NTIS, Springfield, Va. 22151 as AD-733 775, $3.00 paper copy; 95 cents microfiche. Research Report No 2-8, October 1966. 44 p, 2 fig, 3 plate, 7 tab, 17 ref, append.

Descriptors: *Harbors, *Hydraulic similitude, *Hydraulic models, *Sand waves, *Riprap, Model studies, Analytical techniques, Reviews, Currents (Water), Sands, Sediment transport, Engineering structures, Hydraulic structures.
Identifiers: *South China Sea, In-shore harbor.

For an in-shore harbor in the South China Sea, a model study was conducted to obtain design data on riprap cover layers for the beach slope areas and the side slopes of the dredged channel. The conditions for complete similarity of the movement of sand due to periodic gravity waves in the model and the prototype are reviewed. Where sand is used as the model bed material, complete similarity of the movement of sand (and consequently the erosion patterns) in the model and the prototype are impossible to achieve in the model. Analysis of some of the available experimental data on the movement of sand due to periodic gravity waves resulted in the development of criteria for qualitative similarity of the erosion patterns between the model and the prototype. Application of the developed criteria for qualitative similarity of the movement of sand due to periodic gravity waves indicated that a model with a linear scale of 1:15 is capable of reproducing qualitatively the erosion pattern which will occur in the prototype. Thus the riprap model is capable of determining the prototype areas that will require riprapping. (Woodard-USGS)
W72-09615

ICE AND ITS ACTION ON HYDRAULIC STRUCTURES.
For primary bibliographic entry see Field 02C.
W72-09623

THE IOWA LOW TEMPERATURE FLOW FACILITY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 02C.
W72-09627

FLOW MEASUREMENTS OF ICE-COVERED RIVERS IN HOKKAIDO,
Hokkaido Electric Co., Sapporo (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02C.
W72-09628

TEMPERATURE AND FLOW CONDITIONS DURING THE FORMATION OF RIVER ICE,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 02C.
W72-09631

ICE COVER FORMATION AND ASSOCIATED HYDRO-DYNAMIC EFFECTS IN THE LOWER PART OF THE RIVER RHINE,
Rijkswaterstaat, The Hague (Netherlands). Directorate for Water Management and Hydraulic Research.
For primary bibliographic entry see Field 02C.
W72-09634

MEASUREMENTS OF ICE ROUGHNESS AND THE EFFECT OF ICE COVER ON WATER LEVELS IN THREE NORWEGIAN RIVERS,
Norwegian Water Resources and Electricity Board, Oslo. Dept. of Hydrology.
For primary bibliographic entry see Field 02C.
W72-09638

PROBLEMS IN THE UTILIZATION OF WATER RESOURCES (PROBLEMY ISPOL'ZOVANIYA VODNYKH RESURSOV).
Belorusskii Nauchno-Issledovatelskii Institut Melioratsii i Vodnogo Khozyaistva, Minst (USSR).

'Nauka i Tekhnika', Minsk, 1971. 200 p.

Descriptors: Water resources, *Water utilization, Hydrology, *Hydraulics, Water management (Applied), *Water conservation, Water pollution, Water balance, Water types, Water levels, Discharge (Water), Groundwater, Streamflow, Sediments, Methodology, Mathematics, Equations, History, Bibliographies, Publications.
Identifiers: *USSR, *Belorussia, *Engineering hydrology.

This collection of 18 papers is devoted to a study of the complex-use management and conservation of water resources; application of hydrology to engineering practice; hydraulics of open channels; and methods of making hydrogeological calculations. An alphabetical listing by author is appended of 466 titles of papers published in 1961-70 by research workers of the Minsk (Belorussian) Scientific Research Institute on Water Problems of the USSR Ministry of Land Improvement and Water Resources. (Josefson-USGS)
W72-09644

DRAINAGE FROM LEVEL AND SLOPING LAND,
Bureau of Reclamation, Denver, Colo.
E. J. Carlson.
Bureau of Reclamation Report No REC-ERC-71-44, Dec. 1971. 45 p, 15 fig, 3 tab, 6 ref, 2 append.

Descriptors: *Subsurface drains, *Slopes, *Model studies, Hydraulic models, Subsurface drainage, Drainage, Water table, Effects, Mathematical analysis, Envelopes, Model tests, Hydraulic conductivity, Computer programs, Flow nets, Deep percolation, Infiltration rate.
Identifiers: *Slope angles, *Drain spacing, *Test results, Diameters, BRECS (Computer system).

A sand tank model study of drainage by pipe in level and sloping land was made in a 60 ft long, 2 ft wide, and 2-1/2 ft deep flume. The flume could be tilted to a 12% slope. Theoretical equations developed for steady-state drainage conditions on level land were verified. The study indicated that drain spacing formulas developed for level land can be used for spacing midslope drains on sloping land having a shallow impermeable barrier. Computer programs using verified formulas to determine drain spacing and maximum water table height between drains were developed and checked with data obtained from the flume study. The time-sharing computer programs have been included in the Bureau of Reclamation Engineering Computer System (BRECS). (USBR)
W72-09698

FLUSHING STUDIES, VICTORIAL CHANNEL, VICTORIA, TEXAS: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Boland, Jr.
Available from NTIS, Springfield, Va. 22151 AD-734 100, $3.00 paper copy; 95 cents microfiche. Miscellaneous Paper No 2-812, April 1966. 15 p, 1 fig, 8 plate, 1 tab.

Descriptors: *Channels, *Navigation, *Channel flow, *Hydraulic models, *Texas, Cleaning, Engineering structures, Model studies, Desilting, Oily water.
Identifiers: *Victoria Channel (Tex), *Channel flushing, Debris.

Victoria Channel, a Federal navigation project that is being constructed in connection with the Gulf Intracoastal Waterway, is located along the Gulf coast in south-central Texas. The navigation channel will extend approximately 35 channel miles from Antonio Bay to a turning basin about 7 miles south of Victoria, Texas. It is anticipated that a flushing system consisting of a freshwater intake ditch, flushing canal, gate structure, underground conduit, and stilling basin will be required at the upstream end of the 20-mile landlocked channel to remove objectionable surface debris, oil, and foul water. Hydraulic model tests indicate that the rate of flushing of the channel is initially high and decreases with time. For example, a discharge of 1000 cfs flushed 50% of the channel debris in about 17 hr, 75% in about 29 hr, and 95% in about 50 hr. If flushing of the surface stratum only should prove to be acceptable, this can be effected in considerably less time and with less fresh water than would be required to flush the entire channel volume. (Woodard-USGS)
W72-09761

STATUS REPORT ON THE GASTINEAU CHANNEL MODEL STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
F. A. Herrmann, Jr.
Available from NTIS, Springfield, Va. 22151 AD-734 101, Price $3.00 paper copy, 95 cents microfiche. Miscellaneous Paper No 2-843, September 1966. 18 p, 5 fig.

Descriptors: *Channels, *Hydraulic models, *Navigation, *Alaska, *Channel improvement, Model studies, Engineering structures, Tides, Measurement, Currents (Water), Current meters, Velocity.
Identifiers: *Gastineau Channel (Alaska).

A testing program is described concerning improvement of the navigation channel in Gastineau Channel, Alaska. Gastineau Channel is a narrow strait about 16 miles long separating Douglas Island from the mainland of southeastern Alaska. The channel is subject to tidal action at both ends. The tides display a diurnal inequality typical of the Pacific Ocean. The mean tide range at Juneau is 14.0 ft; however, the diurnal range (from mean higher high water to mean lower low water) is 16.6 ft. The extreme tidal range is about 26.5 ft. The model reproduces about seven miles of Gastineau Channel from Fritz Cove to about one mile north of Juneau, Alaska. The model is equipped with the necessary appurtenances to reproduce and measure tidal elevations, current velocities, freshwater inflow, dispersion characteristics, and shoaling distribution. Apparatus used in the reproduction and measurement include two primary tide generators and recorders, tide gages, current velocity meters, freshwater inflow measuring weirs, skimming and measuring weirs, dye injection and measurement equipment, and shoaling injection and recovery apparatus. (Woodard-USGS)
W72-09762

GROUND-WATER HYDRAULICS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-09769

8C. Hydraulic Machinery

NEW INCENTIVES FOR UNDERGROUND TRANSMISSION,
J. Papamarcos.
Power Engineering, Vol 75, No 12, p 27-31, Dec 1971. 2 illus.

Descriptors: *Transmission (Electrical), Submarine cables, Cryogenics, High voltage, Direct currents, Nuclear powerplants, Solar radiation, Transmission lines, Electric insulation, Electric cables, Utilities.
Identifiers: *Underground cables, *Underground transmission lines, Solar power generation, Wave guides, Sulfur fluorides, Submarine cables, High voltage, Buried cables.

Industry's greatest need in this decade will be for economical 138- and 230-kv underground transmission systems rated in the low hundreds of megawatts. Manufacturers have done some research and several types of underground cable are available for use at 138 kv, but the utilities consider the costs too high for general use. The small amount of research initiated by industry may be increased after the Electric Research Council's Waltz Mill underground cable tests have been completed. Underground cable systems with capacities of 5000 mw or higher, are predicted by the yr 2000. Offshore nuclear plants and the need for long lengths of underwater cable to connect the plants with shore switchyards are discussed. Other possibilities are: (1) direct-current cables, (2) high frequency generation, (3) river channel rights-of-way for submarine cables into many large cities, (4) transmitting electric power by wave guides, and (5) solar energy as a power source. (USBR)
W72-09186

PORTABLE SURGE COUNTERS CHECK PHASE-TO-PHASE SURGE LEVELS BETWEEN 115-KV POWER TRANSFORMER BUSHINGS AT BLUE MESA POWERPLANT--COLORADO RIVER STORAGE PROJECT,
Bureau of Reclamation, Denver, Colo.
G. W. Cleaveland.
Bureau of Reclamation Report REC-ERC-71-41, Oct 1971. 12 p, 6 fig, 1 tab, 3 ref, append, disc.

Descriptors: *Power transformers, Alternating current, Electrical faults, Electric power, Transmission lines, Lightning arresters, Statistical analysis, Instrumentation, Field data, Electric discharges.
Identifiers: *Surge counters, *Voltage dividers, *Switching surges, Over voltage, Test results, Test equipment, Flashover, Electrical faults, Transducers.

A surge level counter installation used to verify the adequacy of phase-to-phase 115-kv bushing spacing on a power transformer at Blue Mesa Powerplant, Colo. is described. Surge level statistics, collected over an 18-mo period, indicated the 115-kv bushing spacing was adequate for the 7190 ft altitude and the specific location. Conclusions are: (1) phase-to-phase surge levels rarely exceed 2.6 per unit volts; and (2) during the observation period, phase-to-ground surge levels did not exceed 1.63 per unit volts. Data and drawings on surge level measurements and the surge counter installation are included. (USBR)
W72-09187

FIELD TESTS OF THE 345 KV SERIES COMPENSATED GLEN CANYON-PINNACLE PEAK TRANSMISSION LINES--COLORADO RIVER STORAGE PROJECT,
Bureau of Reclamation, Denver, Colo.
G. W. Cleaveland.
Bureau of Reclamation Report REC-ERC-71-43, Dec 1971. 41 p, 13 fig, 17 illus, 4 tab.

Descriptors: *On-site tests, Electrical stability, Electrical impedance, Electrical equipment, Circuit breakers, Transmission lines.
Identifiers: *Series capacitors, *Capacitators, Overvoltage, Electrical line switching, Switching surges, Short circuits, Interrupter faults.

Results of field tests on the Bureau of Reclamation series compensated 345-kv Glen Canyon-Pinnacle Peak lines are summarized. The tests demonstrated that the fual-permissive overreaching transfer-trip line relaying protecting these lines--each scheme using electromechanical relays and audio tones on a separate microwave voice channel--is operating satisfactorily. Relaying on the 230-kv systems adjacent to the faulted 345-kv lines did not misoperate. The tests showed that high-speed reclosing, especially on the Flagstaff-Pinnacle Peak line sections, would not be satisfactory without means to discharge the trapped line charge. Capacitor reinsertion problems encountered during the first part of the test series were corrected by the manufacturer to provide satisfactory capacitor sparkover and reinsertion characteristics during the final tests. Unsatisfactory voltage polarization at the Glen Canyon terminal was diagnosed and corrected. Tables, oscillograms, and illustrations relating to series capacitor reinsertion, line switching, and relay coordination tests are presented. (USBR)
W72-09192

MANSON UNIT, CHELAN DIVISION, CHIEF JOSEPH DAM PROJECT, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boise, Idaho. Region 1.

Available from the National Technical Information Service as PB-198 968F, $3.00 in paper copy, $0.95 in microfiche. September 1971. 84 p, 1 fig, 2 map, 4 tab, 8 ref.

Descriptors: *Washington, *Environmental effects, *Pumping plants, *Irrigation, Engineering, Pumping, Pump turbines, Intakes, Water delivery, Irrigation systems, Reservoir operation, Irrigation effects, Irrigation operation and maintenance, Irrigation programs, Irrigation water, Land development, Lateral conveyance structures, Water distribution (Applied).
Identifiers: *Environmental Impact Statements, *Lake Chelan (Wash).

The Lake Chelan pumping plant, located near Mason, Washington, includes eight electrically driven pumping units with traveling fish screens. The intake will extend about 60 feet into the lake. The pumping plant will have a design capacity of 101.4 cubic feet per second and will pump about 21,000 acre-feet annually. Development plans call for supplemental irrigation service to 4,175 acres and a full water supply to 2,050 acres of dry land. Irrigation development of grazing and dry cropland would reduce existing wildlife habitat for deer and game birds. The Washington State Department of Game also recommended deer and stockproof fencing. Alternatives included no project, ground water pumping, district planning, and enlargement of existing facilities. Comments of interested agencies are included (Blank-Florida)
W72-09473

APPARATUS FOR CONTROLLING THE DISPERSION OF POLLUTANTS FLOATING ON A BODY OF WATER,
For primary bibliographic entry see Field 05G.
W72-09494

BOOM FOR OIL SPILT ON WATER,
British Petroleum Co. Ltd., London (England). (Assignee).
For primary bibliographic entry see Field 05G.
W72-09495

METHOD OF AND APPARATUS FOR SKIMMING FLOTSAM FROM THE SURFACE OF A BODY OF WATER,
Reynolds International, Inc., Richmond, Va. (Assignee).
For primary bibliographic entry see Field 05G.
W72-09499

APPARATUS FOR REOXYGENATING A BODY OF WATER,
Sanders Associates, Inc., Nashua, N.H. (Assignee).
For primary bibliographic entry see Field 05G.
W72-09503

METHOD AND APPARATUS FOR DESILTING AND/OR DESALTING BODIES OF WATER,
For primary bibliographic entry see Field 04A.
W72-09504

APPARATUS TO CONFINE AND RECOVER OIL SPILLAGE AT SEA,
For primary bibliographic entry see Field 05G.
W72-09507

FLOATING OIL CONTAINMENT APPARATUS,
Air Preheater Co., Inc., Wellsville, N.Y. (Assignee).
For primary bibliographic entry see Field 05G.
W72-09508

SEPARATOR FOR NONMISCIBLE LIQUIDS,
Rotterdams Havenreinigingen Transport (Netherlands).
For primary bibliographic entry see Field 05G.
W72-09509

OIL SPILL REMOVAL METHOD,
Shell Oil Co., New York. (Assignee).
For primary bibliographic entry see Field 05G.
W72-09510

FLOATING BREAKWATER,
For primary bibliographic entry see Field 04A.
W72-09511

FLOATING CONTAMINANT CONSTRAINING FENCE,
For primary bibliographic entry see Field 05G.
W72-09512

ICE AND ITS ACTION ON HYDRAULIC STRUCTURES.
For primary bibliographic entry see Field 02C.
W72-09623

ICE MONITORING EQUIPMENT,
For primary bibliographic entry see Field 02C.
W72-09626

INVESTIGATIONS INTO FRAZIL, BOTTOM ICE AND SURFACE ICE FORMATION IN THE NIAGARA RIVER,
Hydro-Electric Power Commission of Ontario, Toronto.
For primary bibliographic entry see Field 02C.
W72-09632

ICE CONDITIONS IN THE THJORSA RIVER SYSTEM,
National Energy Authority, Reykjavik (Iceland).
For primary bibliographic entry see Field 02C.
W72-09641

THE COMPUTER'S ROLE IN DESIGN OF A 500-KV TRANSMISSION LINE,
Sargent and Lundy, Inc., Chicago, Ill.; and Allegheny Power Service Corp., Greensburg, Pa.
J. R. Arena, A. Beloff, and G. B. Hoffman.
Transmission and Distribution, Vol. 23, No. 12, 48-52, Dec 1971. 5 fig, 1 tab.

Descriptors: *Transmission lines, *Transmission towers, *Computer applications, Economics, Structural design, Electrical design, Extra high voltage, Bundled conductors, Overhead ground wire, Electrical insulators.
Identifiers: *Tower spotting, *Computer-aided design, *Computer tower position, Tower height, Allegheny Power System, *Cost savings, Sagging, Spacing, Electrical insulators.

The Allegheny Power System 500-kv Project consists of 2100 towers spread over 530 mi. Advantages of tower spotting by computer are evident by comparing the steel tonnage used for the manually spotted Phase I towers with the tonnage used for computer spotted Phase II and III towers. Careful design of a transmission line and sound criteria adopted in the early stages of a project do not preclude further refinements resulting from field experience. The designer must recognize the factors contributing to a better overall line. Continuous attention should be given to proper selection of conductor swingover angles, standardization of hardware components, improved methods for design and data handling by computer, and review and updating of field practices. The computer procedures used to ascertain the most economical and acceptable design for a tower at each location are discussed. (USBR)
W72-09699

EXPERIENCE IN THE OPERATION OF THE BRATSK HYDROELECTRIC PLANT,
K. A. Knyazev, and V. I. Sinitsyn.
Hydrotechnical Construction, No. 3, p 206-211, Mar 1971. 5 tab.

Descriptors: *Hydroelectric powerplants, *Power operation and maintenance, Operation and maintenance, Hydraulic turbines, Electric generators, Cavitation, Governors, Hydroelectric power, Operating costs.
Identifiers: *Bratsk powperplant (USSR), Thrust bearings.

The initial operations staff for Bratsk was trained at 2 other hydroelectric plants for several months prior to startup of the first Bratsk units. As additional units were installed, the staff increased until a full complement was attained. In November 1961, initial operation began at a reduced head of 48-52 m (design head is 100 m); 18 units were installed and operating by December 1966. When the power demand exceeds the installed capacity of 4100 mw, 2 more units will be added. Some operating difficulties and the remedial measures taken are discussed. Severe cavitation damage to turbines and water passages during low-head operation was repaired by welding. The problem of improper operation of governor servomotors, revealed during initial operation, was corrected by installing longer operating cylinders. Generator thrust bearing deficiencies on 10 of the 18 units were corrected by installing high-pressure oil systems for the bearings. (USBR)
W72-09703

OPTIMIZING HYDRAULIC TURBINE AND PUMP/TURBINE DESIGN,
Allis-Chalmers Corp., York, Pa.
W. L. Swift.
Allis-Chalmers Engineering Review, Vol. 36, No. 2, p 16-20, 1971. 7 fig, 6 ref.

Descriptors: *Hydraulic turbines, *Pump turbines, Finite element method, Economics, Structural analysis, Hydraulic transients, Hydraulic machinery, Francis turbines, Water hammer, Turbine runners, Cost savings, Computer applications.
Identifiers: *Computer-aided design, Machine design, Mechanical analysis, Spiral cases.

Traditionally, mechanical design of hydraulic turbines and pump/turbines has been associated with conservative safety factors applied to stress and deflection calculations and the application of empirical data derived from accumulated experience. Simplified models which reduced components to analyzable configurations were used with high safety factors to provide dependable designs. Use of computers has eliminated overdesign. Higher ratings are now more practicable because of economies in weight, size, and manufacturing costs. Layout procedure is simplified by using computer programs and punch paper tapes to control machining operations. The structural design can be analyzed using the finite element method and digital computers. Accurate prediictions of hydraulic transients permit the determination of design criteria for most of the equipment within the system. Some program limitations and the types of computers required to perform the engineering functions are discussed. (USBR)
W72-09710

MODEL STUDIES AND DESIGN OF THERMAL OUTFALL STRUCTURES--QUAD-CITIES NUCLEAR PLANT,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 05D.
W72-09740

8D. Soil Mechanics

CHEMICAL STABILIZATION OF SOILS,
Bureau of Reclamation, Denver, Colo.
W. R. Morrison.
Bureau of Reclamation Report REC-ERC-71-30, June 1971. 39 p, 6 fig, 30 photo, 11 tab, 3 ref.

Descriptors: *Soil treatment, *Erosion control, *Slope protection, *Soil stabilization, *Chemical sealants, Laboratory tests, Herbicides, Weathering, Soil sealants, Slope stabilization, Bank stabilization, Asphalt, On-site tests, Slaking, Soil erosion, Elastomers, Emulsions, Polymers.
Identifiers: *Chemical sealants, Acrylics, Asphalt emulsions, Test results.

Laboratory and field evaluations of several petrochemical, liquid soil stabilizers were conducted. Laboratory tests indicated that a sprayable liquid vinyl polymer had excellent properties for stabilizing sandy soil. A deep penetrating liquid cutback asphalt performed satisfactorily in stabilizing dune sand around transmission tower sites along the Fort Thompson-Grand Island 345-kv Transmission Line. A water-base acrylic copolymer is providing satisfactory erosion control on test sections of spoil banks at the Tehama-Colusa and Putah South Canals in Calif. High costs would limit the use of the copolymer material to minimum wind and water erosion control. None of the 5 protective coatings applied to shale seams at Paonia Dam, Colo, was effective in reducing air-slaking. (USBR)
W72-09191

SOIL STABILIZATION: A MISSION ORIENTED APPROACH,
Texas A and M Univ., College Station.
J. A. Epps.
Highway Research Record, No 351, p 1-20, 1971. 8 fig, 13 tab, 54 ref.

Descriptors: *Soil stabilization, *Stabilization, *Soil treatment, *Soils, Bibliographies, Soil aggregates, Soil physical properties, Lime, Portland cements, Bituminous materials, Compressive strength, Sulfates, pH, Soil cement, Road construction, Atterberg limits, Soil mechanics, Pavements, Gradation, Additives.
Identifiers: Marshall method, Base courses.

The selection of chemical additives for improving soil properties and soil-aggregate road base systems is simplified by using flow charts. The stabilization materials considered are lime, cement, bitumens, and combinations of these. After sieve analysis and Atterberg limit tests on natural road base materials, the proper stabilization material, based on the percentage of material passing the No. 200 sieve and the plasticity index, can be determined from the flow charts. Environmental and construction precautions are given for each suggested stabilization material. Testing methods for each type of material are given to determine: (1) the suitability of the soil-stabilizer mixture, and (2) the required proportion of stabilizing material. Lime stabilization criteria use pH and unconfined tests; cement stabilization criteria use pH, sulfate, freeze-thaw and wet-dry tests. (USBR)
W72-09193

DEQUEEN LAKE, ROLLING FORK RIVER, ARKANSAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.

Available from the National Technical Information Service as PB-201 256D, $3.00 in paper copy, $0.95 in microfiche. April 26, 1971. 14 p.

Descriptors: *Arkansas, *Environmental effects, *Flood control, *Water quality control, Multiple-purpose projects, Water supply, Artificial lakes, Damsites, Earth dams, Conduits, Water conveyance, Flood protection, Flow control, Gates, Spillways, Design flow, Maximum probable flood, Project planning, Project purposes, Land management.
Identifiers: *Environmental Impact Statements, *Rolling Fork River (Ark.).

The DeQueen Lake project, located approximately five miles northwest of DeQueen, Arkansas, will consist of an earth filled dam which includes a reinforced concrete conduit with grated control works and an uncontrolled spillway to handle maximum flood flows. The project will greatly reduce annual flood damages and provide dependable yields for water supply and water quality control. Recreation facilities are planned. Controlled discharges should result in increased fish propagation; increased downstream land utilization will be realized as a result of the project. Unavoidable adverse effects include inundation of 1,680 acres of land and 11 archaeological sites, displacement of several families, loss of wildlife, and reduction in smallmouth bass populations. Alternatives to the proposed project include one large downstream lake, non-structural measures, and no development. This draft statement has been sent to interested agencies and groups for review and comment. (Blank-Florida)
W72-09462

WILLARD, KENTUCKY. PARTIAL FLOOD PROTECTION PLAN, DRY FORK OF LITTLE FORK OF LITTLE SANDY RIVER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Huntington, W. Va.

Available from the National Technical Information Service as PB-200 604F, $3.00 in paper copy, $0.95 in microfiche. July 1971. 9 p.

Descriptors: *Flood control, *Project planning, *Environmental engineering, *Environmental effects, Cost-benefit analysis, Federal government, Feasibility studies, Design, Highways, Barriers, Levees, Gates, Culverts, State governments, Backwater, *Kentucky.
Identifiers: *Environmental Impact Statements, Willard (Ky).

A flood control project near a small Appalachian town in Kentucky is discussed. The project, presently in the engineering and design stage, consists of utilizing an existing highway fill as a barrier levee by installation of a flap gate on a culvert to prevent backwater flooding of Willard, Kentucky. Most of the improvements in the town are located in a low-lying area behind a highway fill. Flooding of the improvements results from backwater passing through a highway culvert. The only anticipated adverse environmental effect is a temporary, minor disturbance of outlet and inlet ditches during culvert modification. Authority for construction of the project is provided by Section 205 of the 1948 Flood Control Act. Alternatives are discussed and discounted. The project study was conducted in response to requests of local residents submitted through their Congressman. Comment was solicited from appropriate state and local agencies, but no response was forthcoming. (Waldron-Florida)
W72-09464

FARMERS LEVEE AND DRAINAGE DISTRICT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 04A.
W72-09477

HURRICANE PROTECTION PROJECT, STRATFORD, CONNECTICUT (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Waltham, Mass.

Available from the National Technical Information Service as PB-204 571D, $3.00 in paper copy, $0.95 in microfiche. November 3, 1971. 33 p, 2 map, 6 tab.

Descriptors: *Environmental effects, *Coastal structures, *Flood protection, *Tides, *Connecticut, Economics, Estuaries, Levees, Gates, Floods, Flood control, Conduits, Fish, Marshes, Project benefits, Project planning, Project purposes, Wetlands, Marine biology, Ecosystems, Economic impact, Coasts, Coastal engineering, Estuarine fisheries, Hurricanes.
Identifiers: *Environmental Impact Statements, *Stratford Hurricane Protection Project (Conn.).

Protection against tidal flooding will be provided by construction of levees and floodwalls. A navigation gate and gated conduits will allow regular tidal cycles and tide levels during storms. Completion of the project will not sacrifice the biological productiveness of marshes or recreational opportunities. The ecosystem would still be subject to regular tidal cycles and drainage. Mean tides will be altered. Although this may cause minor biological readjustment, it will not alter basic estuarine productivity. The project will provide a high degree of flood protection for industry, an airport, residential units, and roads. It will also afford protection to the marsh against breaching of the beach. Other than acreage replaced by the barrier, the project will not have any direct adverse environmental effects. There will be no significant damage to fish and wildlife. Abandoning the project will result in foregoing nearly two million dollars of annual economic benefit. Other alternatives are deemed non-feasiblge or poorer than the proposed plan. (Ilkson-Florida)
W72-09478

DYERSBURG, TENNESSEE (DRAFT ENVIRONMENTAL IMPACT STATEMENT).

Available from the National Technical Information Service as PB-203 237D, $3.00 in paper copy, $0.95 in microfiche. April 1971. 6 p, 1 plate.

Descriptors: *Tennessee, *Environmental effects, *Flood protection, *Levees, *Pumping plants, Flood control, Flood damage, Project benefits, Project purposes, Public benefits, Flood plains, Land use, Water resources development, Channel improvement, Reservoir construction, Non-structural alternatives, Flood plain zoning, Flood proofing, Recreation, Wildlife habitats, Aquatic habitats.
Identifiers: *Environmental Impact Statements, Dyersburg (Tenn).

The project consists of construction of a levee and a pumping station for flood protection. No adverse environmental effects are anticipated as a result of construction, except a change in land use within construction rights-of-way. The project requires the commitment of 77 acres of land; this land is of very limited environmental value. The project will provide short and long term flood protection benefits for 340 residences, 16 commercial establishments, a manufacturing firm, and three churches. Alternatives considered include construction of upstream reservoirs, enlarging the river channel to increase its capacity, and flood plain zoning. Flood plain zoning would provide no protection to existing developments in the flood plain. It is also impractical to provide the entire basin with as high a degree of flood protection as is required by the small urban area. Comments have been solicited from interested agencies, groups, and members of the general public. (Brackins-Florida)
W72-09480

LEVEE UNIT NO. L-246, MISSOURI RIVER LEVEE SYSTEM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.

Available from the National Technical Information Service as PB-205 338D, $3.00 in paper copy, $0.95 in microfiche. November 1971. 20 p, 1 map.

Descriptors: *Missouri, *Environmental effects, *Missouri River, *Flood control, *Levees, Check structures, Flood protection, Earthworks, River regulation, Shore protection, Borrow pits, River flow, River forecasting, Sediment control, Aquatic habitats, Wildlife habitats, Soil erosion, Flood forecasting, Project planning, Project purposes.
Identifiers: *Environmental Impact Statements.

The planned flood control works provide a series of levees and appurtenant works along both sides of the Missouri River in Chariton County. The project would provide 100-year main stem flood protection for agricultural lands, forest land, and wildlife habitat. Primary environmental impacts of the proposed action include stream modification and relocation, increased sediment load, construction of borrow pits, and preservation of lake recreational potential. Adverse environmental effects include alteration of stream environment and riparian wildlife habitat; possible soil erosion, increased noise levels, and equipment exhaust emission during construction; and destruction of grass, forbs, timber, and other wildlife habitat due to levee construction. Alternatives to the proposed action include diversion structures, additional channel and levee construction, alternate channel modification, lowering the height of mainstem levees, and no action. This draft statement has been sent to interested parties for comment. (Blank-Florida)
W72-09481

DEVELOPMENT AND TRAIL USE OF ACCEPTANCE SAMPLING PLANS FOR COMPACTED EMBANKMENTS,
North Dakota State Univ., Fargo.
J. L. Jorgenson.
Highway Research Record, No. 357, p 24-34, 1971. 4 fig, 3 tab, 6 ref.

Descriptors: *Statistical methods, *Construction control, *Soil density, Nuclear moisture meters, Nuclear meters, Compaction tests, Compacted soils, Soil tests, Embankments, Compaction, Specifications, Sampling, Soil mechanics, Test results, On-site tests, Control.
Identifiers: *Acceptance tests, Random sampling, In place density, Densimeters, Field density, Nuclear density meters.

A statistical method of accepting or rejecting embankment compaction was compared with current methods based on individual representative samples and a specified minimum compaction. The

proposed method requires determining compaction percentages of 5 density samples taken from random locations. The compaction is acceptable if the average and range of the compaction percentages satisfy specification requirements. The statistically based acceptance methods have the following advantages over the current methods: (1) Random sampling produces an unbiased estimate of average compaction. (2) Greater uniformity of contract enforcement results in better contractor relations. (3) A statistical basis allows a much smaller chance of accepting poor quality construction. (4) The contractor is encouraged to reduce variability in the compaction. A trial application of the statistically based specifications indicated that 2 lots would be rejected using the statistical methods; 9 lots could have been rejected using the current methods. Nuclear moisture-density instruments permitted tests and calculations to be performed in 40 to 90 min per lot. (USBR)
W72-09700

RESISTANCE OF SOIL TO LIQUEFACTION AND SETTLEMENT,
Massachusetts Inst. of Tech., Cambridge.
R. V. Whitman.
Soil and Foundations, Vol. 11, No. 4, p 59-68, Dec 1971. 4 fig, 1 tab, 17 ref, append.

Descriptors: *Cohesionless soils, *Saturated soils, Sands, Earthquake, On-site tests, Earthquake engineering, Soil mechanics, Hydraulic fills, Foundation failure, Soil density, Seismic studies, Soils, Soil dynamics, Settlement (Structural), Dynamic loads, Bibliographics.
Identifiers: *Soil liquefaction, Alluvial deposits, *Liquefaction, Loose soils, Data presentation, Shakers, Niigata earthquake, Japan, Arvin-Tehachapi earthquake, Sheffield Dam (Calif).

A method of organizing field observations of liquefaction during earthquakes is presented. The principal factors for determining whether liquefaction occurs are: (1) intensity of ground shaking, (2) duration of ground shaking, (3) density of the soil, (4) grain size characteristics of the soil, (5) possible cementation of the soil, and (6) depth of the water table. These factors are considered in a plot of the average peak dynamic shear stress, tau sub c, divided by the effective vertical overburden stress, sigma bar sub v, against the apparent relative density of the soil. Plots were made for 13 sites affected by 8 earthquakes. For fine sands found in recent fluvial deposits and uncompacted hydraulic fills, the critical level of tau sub c divided by sigma bar sub for liquefaction is about 0.15. Coarser and denser granular deposits require further investigation. (USBR)
W72-09704

A NEW RING SHEAR APPARATUS AND ITS APPLICATION TO THE MEASUREMENT OF RESIDUAL STRENGTH,
Imperial Coll. of Science and Technology, London (England).
A. W. Bishop.
Geotechnique, Vol. 21, No. 4, p 273-328, Dec 1971. 29 fig, 10 tab, 64 ref, append.

Descriptors: *Soil tests, Soil mechanics, Test results, Clays, Brittleness, Soil strength, Laboratorytests, Test procedures, Shear strength, Laboratory equipment, Bibliographies.
Identifiers: *Ring shear tests, *Residual strength, London, Shear box, Equipment design, *Torsion shear tests, Direct shear, *Shear tests, Torque, Drained shear tests.

Laboratory tests indicate residual strengths of soil determined by multiple reversal direct shear tests are substantially different from the true residual strengths measured by a new ring shear apparatus. Field conditions, such as a slide in a cut, are better represented by the ring shear test because the device can produce large relative displacements in a sheared soil without changing the shearing direction. Remolded or undisturbed ring shear samples have a 6.0 in. outside dia, 4.0 in. inside dia, and a 0.75 in. initial thickness. A new method is given for maintaining a small but adequate clearance between the 2 pairs of metal rings that enclose the upper and lower portions of the soil sample. Although errors in the applied torque and normal load are acceptably low, the new ring shear apparatus is complex and difficult to operate. Test results of 5 soils are presented and discussed. Factors affecting soil brittleness are also considered. (USBR)
W72-09706

8F. Concrete

GROUTING PREPLACED AGGREGATE TO FORM CONCRETE,
Bureau of Reclamation, Denver, Colo.
A. B. Crosby.
Preprint, American Society of Civil Engineers, Annual National Environmental Engineering Meeting, St Louis, Mo, Oct 1971. 30 p, 14 fig.

Descriptors: *Concrete technology, *Concrete construction, *Concrete placing, *Underwater construction, Foundations, Construction methods, Building materials, Fly ash, Concretes, Aggregates, Repairing, Grouting, Viscosity, Strength, Placing, Cement grouting, Concrete properties, Concrete tests.
Identifiers: *Prepacked concrete, *Underwater foundations, Grout mixes.

Preplaced aggregate (PA) concrete is used where normal concrete placement would be unusually difficult, such as underwater construction and masonry repairs. PA concrete is placed by filling the forms with clean, properly graded coarse aggregate and then injecting a structural-quality grout into the voids. A higher percentage of coarse aggregate in point-to-point contact causes PA concrete to have a higher modulus of elasticity than conventional concrete. The volume change on drying of PA concrete is about one-half that of conventional concrete. With a properly proportioned grout mix and good construction practices, the same allowable working stresses can be used with PA concrete as with conventional concrete. To produce satisfactory PA concrete: (1) the coarse aggregate should be clean, (2) the void content of the aggregate in place should be 38 to 48%, (3) the grout must have the proper fluidity and strength, (4) the forms should be of good quality to prevent leakage, and (5) reliable grout piping systems and grouting methods must be used. (USBR)
W72-09190

TESTING METHODS FOR CONCRETE DURABILITY,
Norges Tekniske Hoegskole, Trondheim; and Illinois Univ., Chicago.
O. E. Giorv, and S. P. Shah.
Materials and Structures, Vol. 4, No. 23, p 295-304, Sept-Oct 1971. 11 fig, 8 tab, 19 ref.

Descriptors: *Concrete testing, *Concrete technology, *Cracking, Concrete properties, Wetting, Freeze-thaw tests, Concretes, Electron microscopy, Test results, X-ray analysis, Test procedures, Evaluation, Deterioration, Fractures, Bibliographies.
Identifiers: *Concrete deterioration, Norway, Wetting and drying tests, Flexural strength, Ultrasonic tests.

Experimental techniques for measuring progressive deterioration of concrete as characterized by cracking were investigated. Specimens of pastes, mortars, and concretes were subjected to alternate wetting and drying in sodium sulfate solutions and plain water and to freezing and thawing. The methods used to assess the effects include observing changes in weight, length, flexural strength, and ultrasonic pulse time; quantitative and qualitative optical microscopy; scanning electron microscopy; and energy dispersive X-ray analysis. Results indicate that the ultrasonic pulse method can be used to detect local cracking at an early state of formation. Of the testing methods employed, the progressive deterioration was best reflected by the measurements of pulse time. Measurements of flexural strength also adequately reflected the state of corrosion. Measurements of weight did not consistently indicate damage; those of length were not always reliable. Although scanning electron microscopy was ineffectual for studying cracking, the combination of scanning electron microscopy and energy dispersive X-ray spectrography proved very effective in revealing both the morphology and the composition of some submicroscopic products resulting from important chemical reactions in concrete. (USBR)
W72-09702

TENSILE TESTS OF FERROCEMENT,
Massachusetts Inst. of Tech., Cambridge; and Illinois Univ., Chicago.
A. E. Naaman, and S. P. Shah.
Journal of the American Concrete Institute, Proceedings, Vol 68, No. 9, p 693-698, Sept 1971. 6 fig, 1 tab, 12 ref.

Descriptors: *Reinforced concrete, *Tensile strength, Cracks, Wire, Composite materials, Modulus of elasticity, Tension tests, Concrete technology.
Identifiers: *Ferrocement, *Mesh reinforcement, *Cracking, *Ultimate loads, Ultimate strength, Uniazial tests, Specific surface, Elongation.

An investigation was made to better understand ferrocement as an engineering material and to predict its design properties. Although use of this material is growing, little basic design information is known. The influence of types, sizes, and volumes of wire meshes on elastic, cracking, and ultimate behavior of ferrocement in uniaxial tension was studied. The ultimate strength of ferrocement is the same as that of mesh alone. The modulus of elasticity of ferrocement in tension can be approximately predicted by the law of mixture of composite materials. The specific surface of the reinforcement strongly influenced cracking behavior of ferrocement. The relation between crack spacing and the specific surface of the reinforcement was developed analytically. The relatively large specific surface for ferrocement may account for the combination of very small widths of cracks and high tensile strength. (USBR)
W72-09709

NEW TECHNIQUES FOR QUALITY CONTROL OF CONCRETE,
Bureau of Reclamation, Denver, Colo.
G. B. Wallace, and G. W. DePuy.
Paper, 6th Annual Course on Concrete Materials and Methods of Construction, Canadian Capitol Chapter, America Concrete Institute, Ottawa, Canada, Dec. 1971. 18 p, 13 fig.

Descriptors: *Quality control, *Concrete mixes, *Concrete control, *Concretes, Concrete technology, Compressive strength, Resistivity, Electron microscopy, Test results, Concrete tests, Concrete plants.
Identifiers: *Computer-aided design, Time saving, Methyl methacrylate, Ultrasonic impulse method, Time sharing, *Polymer concretes, Thermal analysis, Monomers, Sonic velocity tests, Batching, Sulfate attack, Freeze-thaw durability.

The inherent variability of natural aggregates introduces problems in producing a uniformly good quality concrete at the batch plant. These problems can be solved by rapid computerized adjustments of mix proportions during batching and mixing. The batch plant must have a telephone and a portable time-sharing computer terminal. A batch plant technician does not require computer experience to learn, in about 2 hr, to make mix adjustments using this equipment. Another result of the search for improved concrete is the develop-

ment of concrete-polymer materials. Concrete impregnated with polymers has greatly improved durability and strength. Polymer-impregnated concrete shows promise for use in desalting plants, precast tunnel liners, concrete pipe, piles, bridge decks, and in many other structures exposed to harsh conditions. Development of polymer-impregnated concrete requires new methods and new applications of laboratory analytical techniques to ensure uniformly good quality. These methods include sonic measurements, dielectric measurements, thermovision, neutron radiography, electron microscopy, infrared spectroscopy, and thermal analysis. (USBR)
W72-09712

SEISMIC RESISTANCE OF PRESTRESSED CONCRETE BEAM-COLUMN ASSEMBLIES,
Canterbury Univ., Christchurch (New Zealand).
R. W. G. Blakeley, and R. Park.
Journal of the American Concrete Institute, Proceedings, Vol. 68, No. 9, p 677-692, Sept 1971. 18 fig, 2 tab, 12 ref, append.

Descriptors: *Prestressed concrete, *Beams (Structural), Deformation, Moments, Energy dissipation, Ductility, Structural behavior, Energy absorption, Earthquake loads, Earthquake-resistant structures, Test procedures, Instrumentation, Displacements, Joints (Connections), Test results, Foreign research.
Identifiers: *Beam columns, Cyclic movement tester, Bond, New Zealand, Posttensioning, Cyclic loads, *Seismic tests, *Frames, Earthquake loads.

Four tests were conducted on full-size precast, prestressed concrete beam-column assemblies under reversed cyclic loading of high intensity. The test variables included the amount of transverse confining steel for ductility and the position of the plastic hinge in the members. These tests showed that prestressed concrete framed structures are capable of resisting moderate earthquakes without structural damage, and can withstand severe earthquakes, although structural damage may occur. Test results indicates that: (1) Energy dissipation is relatively small prior to crushing of the concrete, but substantial after crushing begins. (2) Large postelastic deformations can be available in prestressed concrete members, even when the transverse reinforcement satisfies only prestressed code requirements for shear. (3) Substantial stiffness degadiation occurs when prestressed concrete members are subjected to high intensity cyclic loading. (4) Corrugated metal ducts are recommended for posttensioning cables through columns for both interior and exterior beam-column assemblies. (5) Mortar joints between posttensioned frame members at critical sections behave satisfactorily under seismic load reversals. (USBR)
W72-09713

8G. Materials

TESTING NEW SEWER PIPE INSTALLATIONS,
Ramseier (Roy Edwin) and Associates, Berkeley, Calif.
For primary bibliographic entry see Field 05D.
W72-09595

REGION 7 LAUNCHES PROGRAM TO REDUCE SUBSURFACE DRAIN COSTS,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 04A.
W72-09697

8H. Rapid Excavation

INTEROCEANIC CANAL STUDIES, 1970.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09430

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 1-4.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09431

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIXES 12-14.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09434

INFILL OF NUCLEAR RUBBLE CHIMNEYS BY GROUND WATER,
Teledyne Isotopes, Palo Alto, Calif. Palo Alto Labs.
For primary bibliographic entry see Field 04B.
W72-09617

8I. Fisheries Engineering

STUDY ON THE TOXICITY OF AGRICULTURAL CONTROL CHEMICALS IN RELATION TO FRESHWATER FISHERIES MANAGEMENT: V. SOME EFFECTS OF SODIUM PENTACHLOROPHENATE TO FRESHWATER FISHES,
For primary bibliographic entry see Field 05C.
W72-09184

MANUAL ON THE BIOTECHNOLOGY OF THE PROPAGATION AND REARING OF PHYTOPHAGOUS FISHES.
Bureau of Commercial Fisheries, Washington, D.C. Office of Foreign Fisheries (Translations).

Trans. available from the National Technical Information Service as PB-199 799T, $3.00 in paper copy, $0.95 in microfiche. Bureau of Sport Fisheries Translation, May 1971. 50 p, 17 fig, 1 tab. Trans of Rukovodstvo po Biotekhnike Pazvedeniya I Vyrashchivania Rastitel'noyaknykh Ryb, Moscow, 1970.

Descriptors: *Aquaculture, *Fish farming, *Carp, Fish, Freshwater fish, Fish food organisms, Fish handling facilities, Fish hatcheries, Fish management, Fish stocking, Reviews, Fish eggs.
Identifiers: *Amur, Cyprinids, USSR.

The far eastern phytophagous fishes--the white amur and variegated silver and white carps--are new objects of fish culture in the USSR. Despite the brief period of their propagation there and the fact that experimentation concerning their commercial adoption is far from complete, these fishes comprise an ever greater share of the fish production generated at fish farms. In such areas as the Krasnodar region and the Uzbek SSR, they now comprise about one-half of the market fish reared. This manual, based on a previous (1966) provisional report, considers the cumulative Soviet experience and deals with the latest questions on the propagation and rearing of phytophagous fishes. Many practices in the rearing of these fishes are considered, including the obtaining of progeny, maintenance during growth, their developmental biology and developmental disturbances. (LeGore-Washington)
W72-09722

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES RESEARCH IN VIRGINIA, ANNUAL REPORT FOR FISCAL YEAR 1971.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 09D.
W72-09199

THE RHODE ISLAND WATER RESOURCES RESEARCH PROGRAM, SEVENTH ANNUAL REPORT.
Rhode Island Univ., Kingston. Water Resources Center.
For primary bibliographic entry see Field 09D.
W72-09200

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES RESEARCH IN VIRGINIA, ANNUAL REPORT FOR FISCAL YEAR 1971.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.

Available from the National Technical Information Service as PB-209 891. Bulletin 46, VPI-WRRC-BULL 46, September 1971. 162 p. OWRR A-999-VA (12).

Descriptors: *Water Resources Research Act, *Virginia, Grants, Research and development, Water resources development, Waste water treatment, Water quality, Groundwater, Hydrogeology, *Water Resources Institute.
Identifiers: *Water resources research (Va).

Summaries of annual allotment programs include Economic Disposal of Waste Sludges from Water Treatment Plants, (A-030-VA); A Pre-Impoundment Ecological Study of the Benthic Fauna and Water Quality in the North Ana River, (A-031-VA); Electrochemical Activation and Regeneration of Carbon Surfaces for Teritary Water Treatment, (A-032-VA); Improving Water Quality by Removal of Pesticide Pollutants with Aquatic Plants, (A-033-VA); Seismic Investigation of Ground Water Reservoirs in the Virginia Coastal Plain Sediments, (A-034-VA); Optimal Conditioning Procedures for Waste Activated Sludge Disposal, (A-035-VA); Biology and Chemistry of Surface Freshwater Microlayers, (A-037-VA); and Techniques for Measuring Public Evaluation of Recreational and Hydroelectric Water Use, (A-038). Summaries of matching grant programs include: Effects of Reservoir Operating Policy on Recreation Benefits, (B-009-VA); The Effects of Heated Waste Waters Upon Microbial Communities, (B-017-VA); Convection Heat Transfer from Water Surfaces, (B-012-VA); Analysis of Water Resource Administrative Agencies, (B-025-VA); Function of the Marshes in Reducing Eutrophication of Estuaries of the Middle Atlantic Region, (B-027-VA); Evaluation of Flood Insurance in a Disaster Area, (B-030-VA); and Recovery of Streams Affected by Acid Mine Drainage (B-034-VA).
W72-09199

THE RHODE ISLAND WATER RESOURCES RESEARCH PROGRAM, SEVENTH ANNUAL REPORT.
Rhode Island Univ., Kingston. Water Resources Center.

Available from the National Technical Information Service as PB-209 892. October 1971. 63 p. OWRR A-999-RI (2).

Descriptors: *Rhode Island, *Projects, Research and development, Iron, Manganese, Groundwater, Water pollution sources, Economics, Pollutant identification, *Water Resources Institute.

Progress is reported for research conducted from July 1, 1970 to June 30, 1971 at the Rhode Island Water Resources Center. Methods were sought for removing high concentrations of iron and manganese from groundwater. Pollution of a water supply source by groundwater seepage from septic tanks, sewage lagoons and refuse fills has been followed by the flow in partially saturated soils. Social and economic problems of groundwater pollution were studied; groundwater in Rhode Island offers a least cost alternative to surface impoundment. Basic studies of the nature of pollutants in fresh water included the study of the correlation of structure vs activity of pollutants using snails as detectors; the study of precipitation of trace elements by humic substances; a phase of the biochemical oxidation of hydrocarbons in natural waters using n-heptane; and the field detection of the changes in phytobenthon and periphton caused by pollution. Other projects were devoted to the solution of specific pollution problems.
W72-09200

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

SELECTED TERMS USED IN FISH CULTURE,
Food and Agriculture Organization of the United Nations, Rome (Italy). Terminology and Reference Section.
For primary bibliographic entry see Field 07A.
W72-09261

LIST OF ORGANIZATIONS, MEETINGS, PROGRAMMES, ETC., RELATED TO FISHERIES,
Food and Agriculture Organization of the United Nations, Rome (Italy). Terminology and Reference Section.
For primary bibliographic entry see Field 07A.
W72-09262

COORDINATION DIRECTORY FOR PLANNING STUDIES AND REPORTS, AUGUST 1971.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W72-09273

SOIL NITROGEN CYCLE--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02G.
W72-09299

MERCURY IN THE ENVIRONMENT - AN ANNOTATED BIBLIOGRAPHY,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W72-09420

INTEROCEANIC CANAL STUDIES. ANNEX V. STUDY OF ENGINEERING FEASIBILITY. APPENDIX 17. A BIBLIOGRAPHY.
Atlantic-Pacific Interoceanic Canal Study Commission, Washington, D.C.
For primary bibliographic entry see Field 08A.
W72-09436

ANNOTATED BIBLIOGRAPHY OF PUBLICATIONS ON WATERSHED MANAGEMENT BY THE SOUTHEASTERN FOREST EXPERIMENT STATION, 1928-1970,
Forest Service (USDA) , Asheville, N.C. Southeastern Forest Experiment Station.
For primary bibliographic entry see Field 03B.
W72-09603

10C. Secondary Publication AND Distribution

SYSTEMS ANALYSIS FOR WATER QUALITY MANAGEMENT - SURVEY AND ABSTRACTS.
Enviro Control, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W72-09229

10F. Preparation of Reviews

WASTE TREATMENT LAGOONS-STATE OF THE ART.
Missouri Basin Engineering Health Council, Cheyenne, Wyo.
For primary bibliographic entry see Field 05D.
W72-09386

FILTRATION OF WATER AND WASTEWATER,
University Coll., London (England).
For primary bibliographic entry see Field 05D.
W72-09393

STUDY OF CRUDE OIL AND SOME OF ITS HIGH MOLECULAR COMPOUNDS USING ELECTRON PARAMAGNETIC RESONANCE (REVIEW),
Akademiya Nauk SSSR, Ufa. Bashirskii Filial.
For primary bibliographic entry see Field 05A.
W72-09404

SUBJECT INDEX

2 4 5-T
Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

2 4-DINITROPHENOL
Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

2 4-DNP
Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

ABATE
Polymer Formulations of Dursban and Abate as Mosquito Larvicides, April - October, 1970,
W72-09720 5B

Effects of Polymer Formulations of Dursban and Abate on Non-Target Organism Populations, April - October, 1970,
W72-09721 5C

ABSORPTION
The Rate of Loss of Mercury by Pacific Oysters,
W72-09667 5A

The Relationships Between 32P Accumulation in Algae, Bacteria and Tubificids,
W72-09668 5C

Influence of Soil Water Matric Potential and Hydraulic Conductivity on the Germination of Rape (Brassica napus L.),
W72-09780 3F

ABSTRACTS
Soil Nitrogen Cycle--A Bibliography.
W72-09299 2G

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendix 17. A Bibliography.
W72-09436 8A

ACCEPTANCE TESTS
Development and Trail use of Acceptance Sampling Plans for Compacted Embankments,
W72-09700 8D

ACCLIMATIZATION
Stabilization of Refinery Waste Water with the Activated Sludge Process: Determination of Design Parameters,
W72-09593 5D

ACETIC ACID
Gas-Liquid Chromatographic Determination of Furfural in Aqueous Solution,
W72-09403 5A

ACETYLENE REDUCTION
Nitrogen Fixation by Bacteria in Lake Mize, Florida, and in Some Lacustrine Sediments,
W72-09579 5C

ACHROMOBACTER
Mechanism of the Initial Events in the Sorption of Marine Bacteria to Surfaces,
W72-09568 5C

ACTINOMYCETES
Studies on Actinomycetes and Their Odors,
W72-09696 5F

ACTIVATED CARBON
Chemical-Physical Wastewater Treatment Phase 2: Activated Carbon Adsorption and Polishing,
W72-09302 5D

Waste Water Treatment Process,
W72-09492 5D

Effect of Porous Structure on Carbon Activation.
W72-09581 5D

The Clarification of Paper Mill Effluents by Activated Carbon Produced from Waste Sulfite Liquor and Other Refuse,
W72-09589 5D

Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

Measurement and Control of Particulate Matter in Filter Effluents,
W72-09693 5F

Studies on Actinomycetes and Their Odors,
W72-09696 5F

ACTIVATED SLUDGE
The Biodegradation of Some Sulfated Alkanolamides,
W72-09344 5B

A Mathematical Model of a Final Clarifier.
W72-09382 5D

Activated Sludge Processing.
W72-09389 5D

Stabilization of Refinery Waste Water with the Activated Sludge Process: Determination of Design Parameters,
W72-09593 5D

Microbiological Characterization of Activated Sludge in a Wastewater Treatment Plant Chemically Modified for Phosphorous Removal,
W72-09654 5D

ACTIVATION
Effect of Porous Structure on Carbon Activation.
W72-09581 5D

ADDITIVES
The Analysis of Nitrogen Containing Polymeric Ashless Oil Dispersants by Dialysis and Alumina Chromatography,
W72-09376 5A

ADJACENT LANDOWNERS
Le Van V. Hedlund Plumbing and Heating (Adjacent Landowners Obligation to Accept Natural Drainage of Surface Waters).
W72-09469 6E

ADMINISTRATION
A Water Planning Concept for the State of Washington.
W72-09308 6D

Bear Creek Dam and Lake, Colorado (Draft Environmental Impact Statement).
W72-09474 8A

ADMINISTRATIVE AGENCIES
A Statutory Analysis of Florida's Water Pollution Control Legislation,
W72-09479 6E

ADSORPTION
Chitin and Chitosan as Chromatographic Supports and Absorbents for Collection of Metal Ions from Organic and Aqueous Solutions and Sea Water,
W72-09491 2K

Waste Water Treatment Process,
W72-09492 5D

Adsorption of Lindane and Dieldrin Pesticides on Unconsolidated Aquifer Sands,
W72-09539 5B

The Clarification of Paper Mill Effluents by Activated Carbon Produced from Waste Sulfite Liquor and Other Refuse,
W72-09589 5D

AERATED LAGOONS
Waste Treatment Lagoons-State of the Art.
W72-09386 5D

AERATION
Aeration Systems for Large Navigable Rivers,
W72-09196 5G

Activated Sludge Processing.
W72-09389 5D

The Responses of Molinia Caerulea and Erica tetralix to Soil Aeration and Related Factors. III. Effects of Different Gas Concentrations on Growth in Solution Culture; and General Conclusions,
W72-09572 2I

Biological Factors in Aerator Performance,
W72-09602 5D

Microbiological Characterization of Activated Sludge in a Wastewater Treatment Plant Chemically Modified for Phosphorous Removal,
W72-09654 5D

AEROBIC BACTERIA
Nucleic Acid Enzyme Studies of Nonfermentative Gram-Negative Bacteria Using Thin-Layer Chromatography,
W72-09408 5A

Microbiological Characterization of Activated Sludge in a Wastewater Treatment Plant Chemically Modified for Phosphorous Removal,
W72-09654 5D

AEROSOLS
Submicroscopic Aerosols from Electrically Stressed Water Surfaces,
W72-09214 2B

AFTERGROWTH
Algal Influences on Dieoff Rates of Indicator Bacteria,
W72-09590 5D

AGARS
Nucleic Acid Enzyme Studies of Nonfermentative Gram-Negative Bacteria Using Thin-Layer Chromatography,
W72-09408 5A

AGE
Age of the Last Glacial Maximum in the Western DvinanDnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

Geologic Age of Ancient Lake Sediments of the Mologo-Sheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

AGRICULTURAL WATERSHEDS
Hydrologic Investigation of Small Watersheds in Ohio, Phase I: 1966-1969,
W72-09296 2A

AHERMATYPIC
Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

AIR CONTAMINATION
The Nuclear Power Industry's Need for Rapid and Accurate Estimation of Radioactivity in the Environment,
W72-09438 5A

AIR POLLUTION
Environmental Radioactivity in New Zealand. Quarterly Report, Oct.-Dec. 1970.
W72-09429 5A

Electric Power and the Environment.
W72-09529 6G

AIR TESTING
Testing New Sewer Pipe Installations,
W72-09595 5D

ALASKA
Possible Origin of Clostridium Botulinum Contamination of Eskimo Foods in Northwestern Alaska,
W72-09417 5C

Permafrost Erosion Along the Beaufort Sea Coast,
W72-09546 2J

Arctic Waste Management,
W72-09601 5D

Status Report on the Gastineau Channel Model Study,
W72-09762 8B

ALBERTA (CANADA)
A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

ALCOHOLS
Lanthanide Shift Reagents as an Aid in the NMR Analysis of the Normal Alcohols C6 to C11,
W72-09347 5A

Gas-Solid Chromatography of Organic Compounds using Steam as the Carrier Gas,
W72-09566 5A

ALGAE
Characterization of Phosphorus-Limited Plankton Algae,
W72-09163 5C

Algal Responses to Nutrient Additions in Natural Waters. I. Laboratory Assays,
W72-09164 5C

Natural Carbon Sources, Rates of Replenishment, and Algal Growth,
W72-09168 5C

Phosphorus in Wastewater Effluents and Algal Growth,
W72-09176 5C

Species and Individual Productivity in Phytoplankton Communities,
W72-09239 5C

Gas Chromatographic Analysis of the Higher Fatty Acids of the Alga Chlorella Vulgaris (Pyrenoidosa),
W72-09365 5A

Measurement and Control of Particulate Matter in Filter Effluents,
W72-09693 5F

Research on Algal Odor,
W72-09694 5F

ALGAL
Ecology of the Epipelic Algal Communities in Marion Lake, British Columbia,
W72-09681 5C

ALGAL COMMUNITY IMBALANCE
Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

ALGAL CONTROL
Algae Control by Mixing, Staff Report on Kezar Lake in Sutton, N.H.
W72-09304 5G

ALGORITHMS
Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

ALIQUAT 336S
Coated Wire Ion Selective Electrodes,
W72-09324 2K

ALKALI DEHYDROCHLORINATION
Micro Scale Alkali Treatment for use in Pesticide Residue Confirmation and Sample Cleanup,
W72-09314 5A

ALKALI EXTRACTION
The Characteristics of Residues in Spent Chlorination Liquor,
W72-09592 5D

ALKALI METALS
The Distribution of Cesium, Rubidium, and Potassium in the Quasi-Marine Ecosystem of the Salton Sea,
W72-09574 5B

ALLUVIUM
Ground-Water Volumes from Anomalous Mass Determinations for Alluvial Basins,
W72-09619 2F

ALPHA SPECTROMETRY
Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

ALTA (UTAH)
The Relationship Between Density and Tensile Strength in Snow,
W72-09611 2C

ALTAY TERRITORY
Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

ALTERATION OF FLOW
Stream Channelization: Conflict Between Ditchers, Conservationists,
W72-09538 6E

ALUM
Magnesium Carbonate, A Recycled Coagulant for Water Treatment.
W72-09387 5F

Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

ALUMINA CHROMATOGRAPHY
The Analysis of Nitrogen Containing Polymeric Ashless Oil Dispersants by Dialysis and Alumina Chromatography,
W72-09376 5A

ALUMINUM
Determination of Aluminum in Water,
W72-09330 5A

Disposal of Solid Aluminum Process Wastes in the Ocean,
W72-09552 5C

ALUMINUM SULFATE
Use of Acid-Treated Sodium Silicate in Coagulation,
W72-09691 5F

AMINES
Gas-Solid Chromatography of Organic Compounds using Steam as the Carrier Gas,
W72-09566 5A

AMINO ACIDS
Determination of Nanomolar Quantities of Free Amino Acids Dissolved in North Atlantic Ocean Waters,
W72-09343 5A

AMMONIA
Wastewater Ammonia Removal by Ion Exchange.
W72-09383 5D

Diurnal Uptake of NO3 and NH4 by a Ceratophyllum-Periphyton Community,
W72-09406 5C

AMMONIUM IONS
Coated Wire Ion Selective Electrodes,
W72-09324 2K

AMUR
Manual on the Biotechnology of the Propagation and Rearing of Phytophagous Fishes.
W72-09722 8I

ANAEROBIC LAGOONS
Waste Treatment Lagoons-State of the Art.
W72-09386 5D

ANALOG MODELS
Interceptor Drain Recovery of Canal Seepage,
W72-09197 8A

Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

Electrical Analog Model Study of Water in Guayama Area, Puerto Rico: Phase 1 -- Assembling Data for the Analog Model,
W72-09543 2F

Analysis of the Ground-Water System by Electrical-Analog Model, Avra Valley, Pima and Pinal Counties, Arizona,
W72-09765 7C

ANALYSIS OF VARIANCE
An Analysis of Variance for Categorical Data,
W72-09357 7C

ANALYTICAL TECHNIQUE
Rapid and Simple Determination of 59Fe, 60Co, 65Zn, 137Cs, and 95Zr in Concentrated Salts Solutions,
W72-09440 5A

ANALYTICAL TECHNIQUES
The Determination of Nitrilotriacetic Acid (NTA) in Sewage and Sewage Effluent,
W72-09251 5A

Rapid Photochemical Determination of Uranium (VI) At Trace Levels,
W72-09254 5A

Coated Wire Ion Selective Electrodes,
W72-09324 2K

Role of Solvent Extraction Parameters in Liquid Membrane Ion Selective Electrodes,
W72-09325 2K

Mass Spectrometric Isotope Ratio Measurements and Peak Area Integration using the Peak-Switching Feature of the Aei MS-902,
W72-09326 5A

The Determination of Lead and Cadmium in Soils and Leaves by Atomic Absorption Spectroscopy,
W72-09331 5A

A Modified Delves Cup Atomic Absorption Procedure for the Determination of Lead in Blood,
W72-09332 5A

Determination of Nanomolar Quantities of Free Amino Acids Dissolved in North Atlantic Ocean Waters,
W72-09343 5A

Development and Use of a Large-Volume Automatic Respirometer,
W72-09396 5D

Study of Crude Oil and Some of its High Molecular Compounds Using Electron Paramagnetic Resonance (Review),
W72-09404 5A

A Critical study of Some Parameters in Quantitative in situ Investigations of Thin-Layer Chromatography by Light Absorption Methods,
W72-09411 5A

Voltammetric Measurement of Zinc in the Northeastern Tropical Pacific Ocean,
W72-09413 5A

Rapid Methods for Measuring Raidoactivity in the Environment.
W72-09437 5A

Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

Rapid Identification and Determination of Alpha Emitters in Environmental Samples,
W72-09442 5A

Monitoring of Tritium Under Emergency Conditions,
W72-09443 5A

Rapid Methods for Specific Radionuclide Analysis and their Application to Aquatic Emergency Conditions,
W72-09457 5A

Possible Effects of Organochlorine Pesticides on Primary Productivity and Skeletogenesis of New England Estuarine and Coastal Marine Algae,
W72-09653 5C

A Method for the Analysis of Fish, Animal, and Pultry Tissue for Chlorinated Pesticide Residues,
W72-09684 5A

Measurement and Control of Particulate Matter in Filter Effluents,
W72-09693 5F

ANEMOMETERS
An Inexpensive Heated Thermistor Anemometer,
W72-09610 2D

ANGLONA (ITALY)
Geologic and Hydrologic Study of Northern Sardinia: Report Number 3. The Provision of Water for the Region of Anglona, (In Italian),
W72-09781 6D

ANIMAL BEHAVIOR
Photographic Studies of the Dunging Behavior of Pigs in Confinement,
W72-09153 5G

ANIMALS
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

ANION EXCHANGE
A Comparison of Some Ready-For-Use Thin Layers for the Separation of Heavy Metals with Butanol-3 N HCl,
W72-09353 5A

ANIONIC SURFACTANTS
Nuclear Magnetic Resonance Study of Interaction between Anionic and Nonionic Surfactants in their Mixed Micelles,
W72-09410 5A

ANNUAL FLOOD
Summary of Floods in the United States During 1967,
W72-09222 2E

ANTIMONY
Determination of Antimony in Geological Materials by Atomic Absorption Spectrometry,
W72-09328 5A

The Toluene Extraction of some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part II. Determination of Arsenic and Antimony in Biological Materials at Su bmicrogram Levels,
W72-09368 5A

APPROXIMATION METHOD
Asymptotic Theory of Helical Waves on a Gaseous Jet in a Rotating Viscous Fluid,
W72-09237 2E

AQUACULTURE
Manual on the Biotechnology of the Propagation and Rearing of Phytophagous Fishes.
W72-09722 8I

AQUATIC ANIMALS
Effects of Malathion on Two Warm-Water Fishes and Aquatic Invertebrates in Ponds,
W72-09567 5C

Effects of DDT and Hexachlorocyclohexane on Aquatic Animals (K voprosu o vliyanii DDT i geksakhlorana na vodnyye organizmy),
W72-09652 5C

AQUATIC DRIFT
A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

AQUATIC ENVIRONMENT
The Role of Minor Nutrients in Limiting the Productivity of Aquatic Ecosystems,
W72-09158 5C

AQUATIC INSECTS
The Temporary Abatement of Nuisance Species of Trichoptera with DDD (TDE) Larvicide,
W72-09412 5C

Effects of DDT and Hexachlorocyclohexane on Aquatic Animals (K voprosu o vliyanii DDT i geksakhlorana na vodnyye organizmy),
W72-09652 5C

AQUATIC LIFE
Automatic Monitoring Method Using Biological Concentration for Marine Radioactive Contamination,
W72-09454 5A

Rapid Methods for Specific Radionuclide Analysis and their Application to Aquatic Emergency Conditions,
W72-09457 5A

Present State and Development of Scientific Research on Prevention of Fishery Pollution (Sostoyaniye i perspektivy nauchno-issledovatel'skikh rabot po probleme okhrany rybokhozyaystvennykh vodoyemov ot zagryazneniya),
W72-09648 5C

Determination of the Toxicity of Contaminated Freshwater with Respect to Certain Hydrobionts (Opredeleniye toksichnosti zagryaznennykh presnykh vod v otnoshenii nekotorykh gidrobiontov),
W72-09649 5C

Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

Aquatic Life Survey of the Wabash River--With Special Reference to the Effects of Thermal Effluents on Populations of Macroinvertebrates and Fish, 1967-1969,
W72-09725 5C

AQUATIC PLANTS
Problem of Pesticides in Water Toxicology (Problema pestitsidov v vodnoy toksikologii),
W72-09650 5C

AQUATIC POPULATIONS
A New Species of Troglobitic Asellid From Illinois,
W72-09520 5C

AQUATIC POPULATIONS

Notes on the Biology of Pygospio Elegans from Maine,
W72-09685 5C

AQUATIC PRODUCTIVITY
Potential Uses of Waste Waters and Heated Effluents,
W72-09733 5B

AQUEDUCTS
The Fountains of Rome,
W72-09380 8A

AQUEOUS SOLUTIONS
The Determination of Calcium in the 0.1 to 10 NG Region by Atomic Absorption Spectroscopy with the Heated Graphite Atomizer,
W72-09329 5A

Gas-Liquid Chromatographic Determination of Furfural in Aqueous Solution,
W72-09403 5A

Partial Pressure of Gases Dissolved at Great Depth,
W72-09537 1B

Ion Association and the Analysis of Precise Conductimetric Data,
W72-09544 2K

AQUIFER MANAGEMENT
Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

AQUIFER TESTING
Ground-Water Hydraulics,
W72-09769 2F

AQUIFERS
Groundwater Flow in Calcareous Aquifers in the Vicinity of Barcelona, Spain,
W72-09277 2F

Adsorption of Lindane and Dieldrin Pesticides on Unconsolidated Aquifer Sands,
W72-09539 5B

Mapping Buried Bedrock Topography With Gravity,
W72-09618 2F

Ground-Water Volumes from Anomalous Mass Determinations for Alluvial Basins,
W72-09619 2F

ARABLE LAND
Agricultural Water Demands,
W72-09526 6D

ARCH DAMS
Comparison of Computed and Measured Dynamic Response of Monticello Dam,
W72-09198 8A

ARCTIC
On the Water of the Canadian Arctic Archipelago, an Atlas Presentation of 1961 and 1962 Data,
W72-09227 7C

ARCTIC OCEAN
Rights and Responsibilities of Arctic Coastal States: The Canadian View,
W72-09465 6E

ARCTIC WATERS POLLUTION PREVENTION ACT (CANADA)
Rights and Responsibilities of Arctic Coastal States: The Canadian View,
W72-09465 6E

ARIZONA
Available Soil Water: Time-Distribution in a Warm Season Rangeland,
W72-09271 2A

Chaparral Treatment Effects on Streamflow,
W72-09604 3B

Analysis of the Ground-Water System by Electrical-Analog Model, Avra Valley, Pima and Pinal Counties, Arizona,
W72-09765 7C

ARKANSAS
Water and Land Resources, Ouachita River Basin in Arkansas,
W72-09309 6D

Dequeen Lake, Rolling Fork River, Arkansas (Draft Environmental Impact Statement).
W72-09462 8D

Price Branch of Little La Grue Bayou, De Witt, Arkansas--Flood Control Project (Final Environmental Impact Statement).
W72-09468 4A

Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

ARKANSAS RIVER VALLEY (COLO)
Ground-Water Levels in the Lower Arkansas River Valley of Colorado, 1968-72.
W72-09559 4B

ARMENIA
Atmospheric Precipitation in the Armenian SSR (Atmosfernyye osadki v Armyanskoy SSR),
W72-09746 2B

AROMATIC COMPOUNDS
Displacement Chromatography of Hydrocarbons,
W72-09563 5A

ARSENATES
Arsenate in the Western North Atlantic and Adjacent Regions,
W72-09249 5A

ARSENIC COMPOUNDS
Arsenate in the Western North Atlantic and Adjacent Regions,
W72-09249 5A

ARSENIC RADIOISOTOPES
The Toluene Extraction of some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part II. Determination of Arsenic and Antimony in Biological Materials at Su bmicrogram Levels,
W72-09368 5A

ARTESIA
The Potential Contribution of Desalting to Future Water Supply in New Mexico,
W72-09306 3A

ARTESIAN AQUIFERS
Geochemical Study of the Ground Water of the 'Sables Inferieurs' Confined Aquifer, of the Aquitaine Basin (Etude Geochimique de la Nappe des 'Sables Inferieurs' du Bassin d'Aquitaine),
W72-09269 2F

ASHLESS OIL DISPERSANTS
The Analysis of Nitrogen Containing Polymeric Ashless Oil Dispersants by Dialysis and Alumina Chromatography,
W72-09376 5A

ASPHALTENES
Study of Crude Oil and Some of its High Molecular Compounds Using Electron Paramagnetic Resonance (Review),
W72-09404 5A

ASSAY
Recreational Use of the Columbia River: Evaluation of Environmental Exposure,
W72-09426 6B

Role of Low-Background Beta-Ray Spectrometers for Rapid Assay of Environmental Samples,
W72-09447 5A

Determination of Environmental Radioactivity by Liquid-Scintillation Spectrometry,
W72-09448 5A

Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

ASSIMILATION
Energetics of Natural Populations of Freshwater Macroconsumers,
W72-09666 5C

ASYMPTOTIC THEORY
Asymptotic Theory of Helical Waves on a Gaseous Jet in a Rotating Viscous Fluid,
W72-09237 2E

ATLANTIC OCEAN
Distribution and Composition of Carbonates in the Upper Layer of Bottom Sediments of the Atlantic Ocean (Raspredelenive i sostav karbonatov v verkhnem sloye donnykh osadkov Atlanticheskogo okeana),
W72-09256 2J

ATMOSPHERE
Tropospheric Scavenging of 90Sr and 3H,
W72-09528 5A

ATMOSPHERIC PHYSICS
Airborne and Ground Measurements of the Atmospheric Potential Gradient During a Solar Eclipse,
W72-09220 2B

Meteorological Effects of Cooling Tower Plumes,
W72-09305 2B

ATMOSPHERIC PRESSURE
Float Implosion in Observation Well in Kentucky,
W72-09621 4B

ATMOSPHERIC TRANSPORT
Biogeochemistry of Lakes: Major Substances,
W72-09157 5C

ATOMIC ABSORPTION
Determination of Antimony in Geological Materials by Atomic Absorption Spectrometry,
W72-09328 5A

ATOMIC ABSORPTION SPECTROPHOTOMETRY
Burner Memory Following Atomic Absorption Spectrophotometric Analysis of Moderately Volatile Organometallic Complexes,
W72-09247 5A

The Determination of Calcium in the 0.1 to 10 NG Region by Atomic Absorption Spectroscopy with the Heated Graphite Atomizer,
W72-09329 5A

Determination of Aluminum in Water,
W72-09330 5A

The Determination of Lead and Cadmium in Soils and Leaves by Atomic Absorption Spectroscopy,
W72-09331 5A

Monitoring Metals in Marine Animals,
W72-09718 5A

AUSTRALIA
Kerosene-Like Tainting in Australian Mullet,
W72-09678 5C

Water Quality Records of the Snowy Mountains Region, Australia.
W72-09770 7C

Catalogue of Meteorological Data of the Snowy Mountains Region, Australia.
W72-09771 7C

AUSTRALIA (SNOWY MOUNTAINS REGION)
Water Quality Records of the Snowy Mountains Region, Australia.
W72-09770 7C

Catalogue of Meteorological Data of the Snowy Mountains Region, Australia.
W72-09771 7C

AUTOCORRELATION
Long-Term Cyclic Fluctuations of Atmospheric Precipitation in the USSR (Mnogoletniye tsiklicheskiye kolebaniya atmosfernykh osadkov na territorii SSSR),
W72-09747 2B

AUTOMATIC CONTROL
A Practical On-Stream Particle Size Analysis System,
W72-09372 7B

AVAILABLE WATER
Available Soil Water: Time-Distribution in a Warm Season Rangeland,
W72-09271 2A

AVRA VALLEY (ARIZ)
Analysis of the Ground-Water System by Electrical-Analog Model, Avra Valley, Pima and Pinal Counties, Arizona,
W72-09765 7C

AZERBAYDZHAN
Groundwater and Drainage-Water Mineralization in the Mugan-sal'yany Region (Mineralizatsiya gruntovykh i drenazhnykh vod Mugano-Sal'yanskogo massiva),
W72-09750 4B

AZERBAYDZHAN SSR
Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

BACCHARIS PILULARIS
Salt Spray and Mineral Cycling in Two California Coastal Ecosystems,
W72-09605 2K

BACKWASHING
The Operation of Pressure Type Sand Filters for Hot Mill Waste Waters,
W72-09587 5D

BACTERIA
A Composite Arginine Glucose Medium for the Characterization of Pseudomonas Aeruginosa and Other Gram Negative Bacilli,
W72-09320 5C

Introductory Lecture: Prospects and Problems in Continuous Flow Culture of Micro-Organisms,
W72-09341 5C

Effects of Organochlorine Insecticides on Bacterial Growth, Respiration and Viability,
W72-09361 5C

Biochemical Process,
W72-09502 5D

Methylation of Pentachlorophenol by Trichoderma Virgatum,
W72-09562 5B

BACTERIOPLANKTON
Bacterial Populations as Components of Oceanic Ecosystems,
W72-09351 5B

BAFFIN BAY
Distributional Trends in the Recent Marine Sediments of Northern Baffin Bay,
W72-09763 2L

BALANCE OF NATURE
Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

BALNEOLOGY
Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

BALNEOTHERAPY
Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

BALTIC SEA
The Structure of an Ice Ridge in the Baltic,
W72-09640 2C

BANK PROTECTION
Concrete Blocks for Earth Slope Protection,
W72-09705 4A

BARBADOS OCEANOGRAPHIC AND METEOROLOGICAL EXPERIMENT
Bomex Temporary Archive Description of Available Data,
W72-09263 7C

BARCELONA (SPAIN)
Groundwater Flow in Calcareous Aquifers in the Vicinity of Barcelona, Spain,
W72-09277 2F

BASEMENT COMPLEX
Rural Water Supply in the Basement Complex of Western State, Nigeria,
W72-09275 3B

BASIC DATA COLLECTIONS
Index of Surface-Water Records to September 30, 1970: Part 2.--South Atlantic Slope and Eastern Gulf of Mexico Basins.
W72-09224 2E

Water Resources Investigations in Montana, 1969.
W72-09535 7C

Water Resources Investigations in Kansas, 1968.
W72-09536 7C

An Inventory of Published and Unpublished Fluvial-Sediment Data for California, 1956-70,
W72-09542 2J

Ground-Water Levels in the Lower Arkansas River Valley of Colorado, 1968-72.
W72-09559 4B

Water Temperatures of California Streams, South Coastal Subregion,
W72-09755 2E

Catalogue of Meteorological Data of the Snowy Mountains Region, Australia.
W72-09771 7C

BASINS
Hydro-Physiographic Model,
W72-09234 6A

BATAVIA (NY)
Activated Sludge Processing.
W72-09389 5D

BAYPORT (TEX)
Operation of a Central Waste Treatment System-Bayport Industrial Complex,
W72-09586 5D

BEACH EROSION
Floating Breakwater,
W72-09511 4A

A Guide to the Geology of Delaware's Coastal Environments,
W72-09614 2J

BEACH PROFILES
Beach Water Table and Beach-Profile Measuring Equipment,
W72-09758 7B

BEACHES
Beach Water Table and Beach-Profile Measuring Equipment,
W72-09758 7B

BEAM COLUMNS
Seismic Resistance of Prestressed Concrete Beam-Column Assemblies,
W72-09713 8F

BEAMS (STRUCTURAL)
Seismic Resistance of Prestressed Concrete Beam-Column Assemblies,
W72-09713 8F

BEAR-WASATCH RIVER BASIN
A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

BED LOAD
Initiation of Ripples by Artificial Disturbances,
W72-09260 2J

Sedimentary Structures Formed by Flash Floods in Southern Israel,
W72-09540 2J

BEDROCK TOPOGRAPHY
Mapping Buried Bedrock Topography With Gravity,
W72-09618 2F

BEETS
Liquid Wastes from Canning and Freezing Fruits and Vegetables.
W72-09390 5D

BELORUSSIA
Problems in the Utilization of Water Resources (Problemy ispol'zovaniya vodnykh resursov).
W72-09644 8B

BELORUSSIAN SSR
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

BENECKEA NIGRAPULCHRITUDA
Taxonomy of Marine Bacteria: Beneckea nigrapulchrituda Sp. N.,
W72-09241 5A

BENTHIC FAUNA
Animal-Sediment Relations and Community Analysis of a Florida Estuary,
W72-09177 5C

The Benthic Macrofauna of Moriches Bay, New York,
W72-09181 5C

A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

A Direct Method of Measuring Benthic Primary Production in Streams,
W72-09405 5A

Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

BENTHIC FLORA
A Direct Method of Measuring Benthic Primary Production in Streams,
W72-09405 5A

BENTHOS
Experimental Study of the Fouling Process at Sea,
W72-09564 5A

BENZALKONIUM CHLORIDE
Effect of a Hostile Environment on Pseudomonas aeruginosa,
W72-09244 5C

BETA SPECTROMETRY
Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

Measurements of 89Sr and 90Sr in Environmental Samples by a Low-Background Beta-Ray Spectrometer,
W72-09450 5A

BIAS REDUCTION
On Bias Reduction in Estimation,
W72-09358 7C

BIBLIOGRAPHIES
List of Organizations, Meetings, Programmes, Etc., Related to Fisheries,
W72-09262 7A

Soil Nitrogen Cycle--A Bibliography.
W72-09299 2G

Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendix 17. A Bibliography.
W72-09436 8A

Annotated Bibliography of Publications on Watershed Management by the Southeastern Forest Experiment Station, 1928-1970,
W72-09603 3B

BILLINGS (MONT)
Western Unit Flood Protection Project, Billings, Montana (Draft Environmental Impact Statement).
W72-09482 4A

BIO-ENERGETICS
Energetics of Natural Populations of Freshwater Macroconsumers,
W72-09666 5C

BIOASSAY
Algal Responses to Nutrient Additions in Natural Waters. I. Laboratory Assays,
W72-09164 5C

Role of Low-Background Beta-Ray Spectrometers for Rapid Assay of Environmental Samples,
W72-09447 5A

Determination of Environmental Radioactivity by Liquid-Scintillation Spectrometry,
W72-09448 5A

Effects of Petroleum Fractions on the Early Development of a Sea Urchin,
W72-09677 5C

BIOASSAYS
Toxicity Assessment of Treated Municipal Wastewaters,
W72-09582 5D

BIOCHEMICAL OXYGEN DEMAND
Development and Use of a Large-Volume Automatic Respirometer,
W72-09396 5D

Operation of a Central Waste Treatment System-Bayport Industrial Complex,
W72-09586 5D

BIOCHEMISTRY
Biogeochemistry of Lakes: Major Substances,
W72-09157 5C

Biogeochemical Sources of Iodine and Cobalt in Moldavia (Biogeokhimicheskiye provintsii yoda i kobalta v Moldavii),
W72-09643 2K

BIODEGRADATION
The Biodegradation of Some Sulfated Alkanolamides,
W72-09344 5B

Biochemical Process,
W72-09502 5D

Multi-Stage Plastic Media Treatment Plants,
W72-09598 5D

BIOGEOCHEMISTRY
Biogeochemical Sources of Iodine and Cobalt in Moldavia (Biogeokhimicheskiye provintsii yoda i kobalta v Moldavii),
W72-09643 2K

BIOLOGICAL AVAILABILITY
Zinc Retention in Young Rats Fed Increasing Levels of High-Zinc Oysters,
W72-09716 5C

BIOLOGICAL COMMUNITIES
Invertebrates Collected on and around Carroll Island, Maryland,
W72-09173 5C

Animal-Sediment Relations and Community Analysis of a Florida Estuary,
W72-09177 5C

Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

Ecology of the Epipelic Algal Communities in Marion Lake, British Columbia,
W72-09681 5C

BIOLOGICAL MEMBRANES
Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

BIOLOGICAL PROPERTIES
Taxonomy of Marine Bacteria: Beneckea nigrapulchrituda Sp. N.,
W72-09241 5A

Effect of a Hostile Environment on Pseudomonas aeruginosa,
W72-09244 5C

BIOLOGICAL SAMPLES
Determination of Copper, Iron, and Zinc From a Single Small Sample,
W72-09243 5A

Cyanide Extraction and Electrodisposition of Trace Amounts of Radioactive Silver From Large Biological Samples,
W72-09246 5A

Rapid Determination of Some Transuranium Elements in Biological Material by Liquid Scintillation Counting,
W72-09354 5A

BIOLUMINESCENCE
Bioluminescence and Primary Productivity in Marine Estuarine Environments,
W72-09575 5C

BIOMASS
Experimental Study of the Fouling Process at Sea,
W72-09564 5A

Relationship between the Productivity of Marine Mollusks and Their Life-Span,
W72-09569 5C

Bioluminescence and Primary Productivity in Marine Estuarine Environments,
W72-09575 5C

BLACK SEA
Experimental Study of the Fouling Process at Sea,
W72-09564 5A

BLACKWELL (OKLA)
Point Discharge Current in Blackwell, Oklahoma, June 1969 - September 1970,
W72-09218 2B

BLEACHING WASTES
Electrically Induced Coagulation of Lignin from Kraft Mill Wastewaters,
W72-09597 5D

BLOOD
A Modified Delves Cup Atomic Absorption Procedure for the Determination of Lead in Blood,
W72-09332 5A

BOTTOM SAMPLING
Data on Samples for Surf Clams and Ocean Quahogs,
W72-09521 7C

BOTTOM SEDIMENTS
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

Distribution and Composition of Carbonates in the Upper Layer of Bottom Sediments of the Atlantic Ocean (Raspredelenive i sostav karbonatov v verkhnem sloye donnykh osadkov Atlanticheskogo okeana),
W72-09256 2J

BOTULISM
Possible Origin of Clostridium Botulinum Contamination of Eskimo Foods in Northwestern Alaska,
W72-09417 5C

BRATSK POWPERPLANT (USSR)
Experience in the Operation of the Bratsk Hydroelectric Plant,
W72-09703 8C

BREAKWATERS
Floating Breakwater,
W72-09511 4A

BRINE DISPOSAL
The Potential Contribution of Desalting to Future Water Supply in New Mexico,
W72-09306 3A

BROOK TROUT
Infectious Pancreatic Necrosis Virus: Comparative Frequencies of Isolation From Feces and Organs of Brook Trout (Salvelinus fontinalis),
W72-09152 5A

BUFFER COMPONENTS
Mechanism of Hydrogen Ion Buffering in Natural Waters,
W72-09687 5F

BUFFERS
Development and Use of a Large-Volume Automatic Respirometer,
W72-09396 5D

BULGARIA
Perennial Grass Mixtures for Hay-Pasture Use of Low-Productive and Eroded Lands Under Dry Farming Conditions, (In Bulgarian),
W72-09772 3F

BURLINGTON COUNTY
A Master Sewerage Plan for Burlington County, New Jersey.
W72-09303 6D

BURNER MEMORY
Burner Memory Following Atomic Absorption Spectrophotometric Analysis of Moderately Volatile Organometallic Complexes,
W72-09247 5A

BURNOFF
Effect of Porous Structure on Carbon Activation.
W72-09581 5D

BYPRODUCTS
Membrane Processing of Cottage Cheese Whey for Pollution Abatement.
W72-09385 5D

Handling Waste Disposal at a Major Food Plant,
W72-09591 5D

CACHE VALLEY (UTAH AND IDAHO)
Ground-Water Resources of Cache Valley, Utah and Idaho,
W72-09558 4B

CADDISFLIES
The Temporary Abatement of Nuisance Species of Trichoptera with DDD (TDE) Larvicide,
W72-09412 5C

Emergence of Caddisflies (Trichoptera) and Mayflies (Ephemeroptera) from Heming Lake, Manitoba,
W72-09570 5C

Emergence Trap Collections of Trichoptera from an Oregon Stream,
W72-09571 5A

The Effect of Temperature on the Feeding Rate and Behavior of the Caddisfly Hydropsyche frisoni,
W72-09686 5C

CADMIUM
The Determination of Lead and Cadmium in Soils and Leaves by Atomic Absorption Spectroscopy,
W72-09331 5A

CALANUS GLACIALIS
Some Quantitative Feeding Patterns Exhibited by the Copepod Calanus,
W72-09248 5C

CALANUS HELGOLANDICUS
Some Quantitative Feeding Patterns Exhibited by the Copepod Calanus,
W72-09248 5C

CALCINATION
Present Status of the U.S. Program on the Solidification of High Level Wastes,
W72-09584 5D

CALCIUM
The Determination of Calcium in the 0.1 to 10 NG Region by Atomic Absorption Spectroscopy with the Heated Graphite Atomizer,
W72-09329 5A

Decontamination of Radioactive Aqueous Effluent by the Calcium-Ferric Phosphate Process,
W72-09692 5F

CALCIUM CARBONATE
Distribution and Composition of Carbonates in the Upper Layer of Bottom Sediments of the Atlantic Ocean (Raspredelenive i sostav karbonatov v verkhnem sloye donnykh osadkov Atlanticheskogo okeana),
W72-09256 2J

CALIBRATIONS
Simple Device for Introduction of Mass Calibrant into a Gas Chromatograph-Mass Spectrometer System,
W72-09323 2K

CALIFORNIA
An Inventory of Published and Unpublished Fluvial-Sediment Data for California, 1956-70,
W72-09542 2J

Salt Spray and Mineral Cycling in Two California Coastal Ecosystems,
W72-09605 2K

Water Temperatures of California Streams, South Coastal Subregion,
W72-09755 2E

CANADA
On the Water of the Canadian Arctic Archipelago, an Atlas Presentation of 1961 and 1962 Data,
W72-09227 7C

A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

Rights and Responsibilities of Arctic Coastal States: The Canadian View,
W72-09465 6E

U.S. Opposes Unilateral Extension by Canada of High Seas Jurisdiction.
W72-09472 6E

Emergence of Caddisflies (Trichoptera) and Mayflies (Ephemeroptera) from Heming Lake, Manitoba,
W72-09570 5C

CANADIAN ARCTIC ARCHIPELAGO
On the Water of the Canadian Arctic Archipelago, an Atlas Presentation of 1961 and 1962 Data,
W72-09227 7C

CANAL CONSTRUCTION
Public Safety and Underground Nuclear Detonations,
W72-09427 5G

Interoceanic Canal Studies, 1970.
W72-09430 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 1-4.
W72-09431 8A

Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 5-8.
W72-09432 8A

CANAL SEEPAGE
Interceptor Drain Recovery of Canal Seepage,
W72-09197 8A

Two- and Three-Dimensional Infiltration: Seepage From Irrigation Channels and Infiltrometer Rings,
W72-09270 4A

CANNERIES
Liquid Wastes from Canning and Freezing Fruits and Vegetables.
W72-09390 5D

CAPACITATORS
Field Tests of the 345 KV Series Compensated Glen Canyon-Pinnacle Peak Transmission Lines--Colorado River Storage Project,
W72-09192 8C

CAPE COD BAY
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

CAPITAL COSTS
Capital and Operating Costs--AWT,
W72-09140 5D

CARBAMATE PESTICIDES
Determination of Carbetamide Residues and its Aniline Metabolite,
W72-09316 5A

CARBETAMIDE
Determination of Carbetamide Residues and its Aniline Metabolite,
W72-09316 5A

CARBON
Nutrients and Eutrophication: The Limiting Nutrient Controversy.
W72-09155 5C

The Interrelation of Carbon and Phosphorus in Regulating Heterotrophic and Autotrophic Populations in an Aquatic Ecosystem, Shriner's Pond,
W72-09159 5C

The Role of Carbon in Hard-Water Marl Lakes,
W72-09161 5C

Carbon Limitation in Sewage Lagoons,
W72-09162 5C

Natural Carbon Sources, Rates of Replenishment, and Algal Growth,
W72-09168 5C

Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

CARBON REGENERATION
Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

CARBONATES
Distribution and Composition of Carbonates in the Upper Layer of Bottom Sediments of the Atlantic Ocean (Raspredelenive i sostav karbonatov v verkhnem sloye donnykh osadkov Atlanticheskogo okeana),
W72-09256 2J

CARBONATION
The Use of Sewage Effluent at South African Pulp and Paper Industries' Enstra Bleached Kraft Mill,
W72-09399 5D

CARNIVORES
Energetics of Natural Populations of Freshwater Macroconsumers,
W72-09666 5C

CARP
Causes of Number Variation in Replenishment of the Kakhovka Reservoir Carp School, (In Russian),
W72-09202 2H

Manual on the Biotechnology of the Propagation and Rearing of Phytophagous Fishes.
W72-09722 8I

CARROLL ISLAND (MD)
Invertebrates Collected on and around Carroll Island, Maryland,
W72-09173 5C

CATALYSTS
Selective Hydrogenation of Soybean Oil. VI. Copper-on-Silica Gel Catalysts,
W72-09346 5A

CATEGORICAL DATA
An Analysis of Variance for Categorical Data,
W72-09357 7C

CATFISHES
High Density Fish Culture.
W72-09522 6B

Effects of Malathion on Two Warm-Water Fishes and Aquatic Invertebrates in Ponds,
W72-09567 5C

CATTLE FEEDLOTS
Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

CAYUGA LAKE (N.Y.)
Research on the Physical Aspects of Thermal Pollution.
W72-09728 5B

CENTRALIZED WASTE TREATMENT FACILITIES
Operation of a Central Waste Treatment System-Bayport Industrial Complex,
W72-09586 5D

CERATOPHYLLUM DEMERSUM
Diurnal Uptake of NO3 and NH4 by a Ceratophyllum-Periphyton Community,
W72-09406 5C

CERIUM
Determination of the Toxicity of Contaminated Freshwater with Respect to Certain Hydrobionts (Opredeleniye toksichnosti zagryaznennykh presnykh vod v otnoshenii nekotorykh gidrobiontov),
W72-09649 5C

CESIUM
Fallout Cesium-137 in Clams (Rangia Cuneata) From the Neuse River Estuary, North Carolina,
W72-09337 5A

Standard Method of Test for Radioactive Cesium in Water.
W72-09423 5A

Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

The Distribution of Cesium, Rubidium, and Potassium in the Quasi-Marine Ecosystem of the Salton Sea,
W72-09574 5B

CESIUM-137
Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

CHALCOCITE
Chalcocite Oxidation and Coupled Carbon Dioxide Fixation by Thiobacillus Ferrooxidans,
W72-09359 5C

CHANNEL CATFISH
High Density Fish Culture.
W72-09522 6B

CHANNEL FLOW
Flushing Studies, Victorial Channel, Victoria, Texas: Hydraulic Model Investigation,
W72-09761 8B

CHANNEL FLUSHING
Flushing Studies, Victorial Channel, Victoria, Texas: Hydraulic Model Investigation,
W72-09761 8B

CHANNEL IMPROVEMENT
The Effect of Channelization on the Environment.
W72-09459 5G

Lagoon Pond Navigation Project, Martha's Vineyard, Massachusetts (Final Environmental Impact Statement).
W72-09463 4A

Price Branch of Little La Grue Bayou, De Witt, Arkansas--Flood Control Project (Final Environmental Impact Statement).
W72-09468 4A

Hudson River Channel, New York--Operation and Maintenance Action (Draft Environmental Impact Statement).
W72-09483 4A

Status Report on the Gastineau Channel Model Study,
W72-09762 8B

CHANNELING
The Effect of Channelization on the Environment.
W72-09459 5G

CHANNELS
Stream Channelization: Conflict Between Ditchers, Conservationists,
W72-09538 6E

Flushing Studies, Victorial Channel, Victoria, Texas: Hydraulic Model Investigation,
W72-09761 8B

Status Report on the Gastineau Channel Model Study,
W72-09762 8B

CHAPARRAL
Chaparral Treatment Effects on Streamflow,
W72-09604 3B

CHAVES COUNTY (N MEX)
Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

CHEMCONTROL
Chaparral Treatment Effects on Streamflow,
W72-09604 3B

Polymer Formulations of Dursban and Abate as Mosquito Larvicides, April - October, 1970,
W72-09720 5B

Effects of Polymer Formulations of Dursban and Abate on Non-Target Organism Populations, April - October, 1970,
W72-09721 5C

CHEMICAL ANALYSIS
Performance and Application of a New Reference Electrode for Process Potentiometric Measurements,
W72-09242 5A

The Spectrofluorimetric Determination of Sulphide,
W72-09253 5A

Analysis of Small Quantities of Saccharides in Aqueous Effluents,
W72-09419 5A

Determination of Plutonium in Environmental Surveillance Samples,
W72-09441 5A

Occurrence and Distribution of Trace Elements in New Jersey Streams,
W72-09545 5A

The Characteristics of Residues in Spent Chlorination Liquor,
W72-09592 5D

Water Quality Records of the Snowy Mountains Region, Australia.
W72-09770 7C

CHEMICAL-BIOLOGICAL TREATMENT
Microbiological Characterization of Activated Sludge in a Wastewater Treatment Plant Chemically Modified for Phosphorous Removal,
W72-09654 5D

CHEMICAL CONDITIONING
Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

CHEMICAL INTERACTION
Nuclear Magnetic Resonance Study of Interaction between Anionic and Nonionic Surfactants in their Mixed Micelles,
W72-09410 5A

CHEMICAL INTERFERENCE
Cyanide Extraction and Electrodisposition of Trace Amounts of Radioactive Silver From Large Biological Samples,
W72-09246 5A

CHEMICAL OXYGEN DEMAND
Organic Concentration and Hydraulic Loading Versus Organic Loading in Evaluation of Trickling Filter Performance,
W72-09596 5D

CHEMICAL PRECIPITATION
Magnesium Carbonate, A Recycled Coagulant for Water Treatment.
W72-09387 5F

Phosphate Precipitation with Ferrous Iron,
W72-09388 5D

Plating and Industrial Waste Treatment at the Expanded Plant of Fisher Body, Elyria, Ohio,
W72-09594 5D

CHEMICAL PROPERTIES
Biogeochemistry of Lakes: Major Substances,
W72-09157 5C

Kinetics of OH Radical Reactions in Irradiated Ordinary and Supercooled Water,
W72-09428 5B

Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

CHEMICAL SEALANTS
Chemical Stabilization of Soils,
W72-09191 8D

CHEMICAL TREATMENT
Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

CHEMOSTAT THEORY
Introductory Lecture: Prospects and Problems in Continuous Flow Culture of Micro-Organisms,
W72-09341 5C

CHERNOZEMS
Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

CHESTNUT SOILS
Effects of Irrigation on Salt Regime of Dark-Chestnut Terrace Soils in the Transvolga Region (Vliyaniye orosheniya na solevoy rezhim terrasovykh temno-kashtanovykh pochv Zavolzh'ya),
W72-09751 3F

CHICAGO (ILL)
Variations of Sulfur Isotope Ratios in Samples of Water and Air near Chicago,
W72-09336 5B

CHITIN
Chitin and Chitosan as Chromatographic Supports and Absorbents for Collection of Metal Ions from Organic and Aqueous Solutions and Sea Water,
W72-09491 2K

CHITOSAN
Chitin and Chitosan as Chromatographic Supports and Absorbents for Collection of Metal Ions from Organic and Aqueous Solutions and Sea Water,
W72-09491 2K

CHLORAMPHENICAL
The Relationships Between 32P Accumulation in Algae, Bacteria and Tubificids,
W72-09668 5C

CHLORELLA
Light-Induced Inhibition of Respiration in DCMU-Poisoned Chlorella by Photosystem I Activity,
W72-09178 5C

CHLORELLA PYRENOIDOSA
The Relationships Between 32P Accumulation in Algae, Bacteria and Tubificids,
W72-09668 5C

CHLORIDE
Studies on Actinomycetes and Their Odors,
W72-09696 5F

CHLORINATED HYDROCARBON PESTICIDES
DDT Residues in Salinas River Sediments,
W72-09313 5B

Micro Scale Alkali Treatment for use in Pesticide Residue Confirmation and Sample Cleanup,
W72-09314 5A

Column Extraction of Pesticides from Fish, Fish Food and Mud,
W72-09315 5A

Appearance of 1-Hydroxychlordene in Soil, Crops, and Fish,
W72-09317 5A

The Temporary Abatement of Nuisance Species of Trichoptera with DDD (TDE) Larvicide,
W72-09412 5C

Uptake, Assimilation, and Loss of DDT Residues by Euphausia pacifica, A Euphausid Shrimp,
W72-09519 5C

Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

Methylation of Pentachlorophenol by Trichoderma Virgatum,
W72-09562 5B

Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

CHLORINATED MUNICIPAL WASTES
Chlorinated Municipal Waste Toxicities to Rainbow Trout and Fathead Minnows.
W72-09154 5C

CHLORINATION
Chlorinated Municipal Waste Toxicities to Rainbow Trout and Fathead Minnows.
W72-09154 5C

The Characteristics of Residues in Spent Chlorination Liquor,
W72-09592 5D

CHLOROFORM
The Effect of Chloroform in Sewage on the Production of Gas From Laboratory Digesters,
W72-09398 5D

CHROMATOGRAPHY
Thin Layer Chromatography and Infra-Red and Ultra-Violet Spectra of Fenthion and Seven of its Degradation Products,
W72-09182 5A

Simple Device for Transferring and Eluting Thin-Layer Chromatographic Fractions,
W72-09342 2K

A Comparison of Some Ready-For-Use Thin Layers for the Separation of Heavy Metals with Butanol-3 N HCl,
W72-09353 5A

Gas Chromatographic Analysis of the Higher Fatty Acids of the Alga Chlorella Vulgaris (Pyrenoidosa),
W72-09365 5A

Nucleic Acid Enzyme Studies of Nonfermentative Gram-Negative Bacteria Using Thin-Layer Chromatography,
W72-09408 5A

A Critical study of Some Parameters in Quantitative in situ Investigations of Thin-Layer Chromatography by Light Absorption Methods,
W72-09411 5A

Rapid and Simple Determination of 59Fe, 60Co, 65Zn, 137Cs, and 95Zr in Concentrated Salts Solutions,
W72-09440 5A

CHROMATOGRAPHY

Chitin and Chitosan as Chromatographic Supports and Absorbents for Collection of Metal Ions from Organic and Aqueous Solutions and Sea Water,
W72-09491 2K

Displacement Chromatography of Hydrocarbons,
W72-09563 5A

Gas-Solid Chromatography of Organic Compounds using Steam as the Carrier Gas,
W72-09566 5A

CHROMATOGRAPHY PEAKS
More Accurate Gas-Chromatographic Analysis Using Flame-Ionization Detector,
W72-09373 5A

CIRCULATING PUMPS
Air Cooling for Condensation and Exhaust Heat Rejection in Large Generating Stations,
W72-09738 5D

CIRCULATION
Self-Diffusion of Trace Concentrations of Ce-144, Pm-147, and Eu-155 in Water Solutions,
W72-09530 5B

CITIES
The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

CITY PLANNING
The Master Plan, Town of Poestenkill, N.Y., Volume 2.
W72-09300 6D

Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

CLAMS
Fallout Cesium-137 in Clams (Rangia Cuneata) From the Neuse River Estuary, North Carolina,
W72-09337 5A

Data on Samples for Surf Clams and Ocean Quahogs,
W72-09521 7C

Upper Temperature Tolerances of Some Estuarine Bivalves,
W72-09734 5C

CLAY COUNTY (ARK)
Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

CLAY COUNTY (NEBR)
Use of Groundwater for Irrigation in Clay County, Nebraska, 1970,
W72-09756 4B

CLAYS
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

CLINOPTILOLITE
Wastewater Ammonia Removal by Ion Exchange.
W72-09383 5D

CLOSED CONDUIT FLOW
Change of Velocity Distribution in a Cross-Section of a Freezing River and the Effect of Frazil Ice Loading on Velocity Distribution,
W72-09636 2C

CLOSTRIDIUM
Factors Involved in the Isolation of Clostridium Perfringens,
W72-09370 5A

Possible Origin of Clostridium Botulinum Contamination of Eskimo Foods in Northwestern Alaska,
W72-09417 5C

Nitrogen Fixation by Bacteria in Lake Mize, Florida, and in Some Lacustrine Sediments,
W72-09579 5C

CLOSTRIDIUM PERFRINGENS
Factors Involved in the Isolation of Clostridium Perfringens,
W72-09370 5A

CLOUD FORMATION
Meteorological Effects of Cooling Tower Plumes,
W72-09305 2B

CLOUD PHYSICS
Structure and Modification of Clouds and Fogs,
W72-09201 2B

Experimental Studies of Freezing, Wake Effect, and Breakup of Freely Suspended Supercooled Water Drops,
W72-09204 2B

Theory of Hail Growth,
W72-09205 2B

Estimation of the Occurrence of Hail and Hailstone Sizes,
W72-09206 2B

Large Vertical Wind Tunnel for Hydrometeor Studies,
W72-09210 2B

Charging of Droplets by Impulse Corona,
W72-09212 2B

Field-Enhanced Propagation of Positive Streamers and Implications to Electrically Influenced Droplet Coalescence,
W72-09213 2B

Submicroscopic Aerosols from Electrically Stressed Water Surfaces,
W72-09214 2B

Effect of Electric Field on Charge Separation by the Falling Precipitation Mechanism in Thunderclouds,
W72-09215 2B

Miniature Whirlwinds Produced in the Laboratory by High-Voltage Electrical Discharges,
W72-09216 2B

CLOUD SEEDING
The Seeding of Ice Saturated Layers in the Atmosphere: A Computational Study,
W72-09207 2B

CLOUDS
The Design, Construction, and Use of an Ice Crystal Counter for Ice Crystal Cloud Studies by Aircraft,
W72-09209 2B

Design, Construction and Testing of the Dropsonde,
W72-09211 2B

Meteorological Effects of Cooling Tower Plumes,
W72-09305 2B

CLUPEA HARGENUS
Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

COAGULATION
Magnesium Carbonate, A Recycled Coagulant for Water Treatment.
W72-09387 5F

Electrically Induced Coagulation of Lignin from Kraft Mill Wastewaters,
W72-09597 5D

Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

Use of Acid-Treated Sodium Silicate in Coagulation,
W72-09691 5F

Stoichiometry of the Coagulation of Color-Causing Organic Compounds with Ferric Sulfate,
W72-09695 5F

COALESCENCE
Experimental Evaluation of Fibrous Bed Coalescers for Separating Oil-Water Emulsions.
W72-09580 5D

COALS
Effect of Porous Structure on Carbon Activation.
W72-09581 5D

COASTAL GEOMORPHOLOGY (DEL)
A Guide to the Geology of Delaware's Coastal Environments,
W72-09614 2J

COASTAL STRUCTURES
Hurricane Protection Project, Stratford, Connecticut (Draft Environmental Impact Statement).
W72-09478 8D

COASTAL WATERS
Rights and Responsibilities of Arctic Coastal States: The Canadian View,
W72-09465 6E

U.S. Opposes Unilateral Extension by Canada of High Seas Jurisdiction.
W72-09472 6E

Offshore Oil Pollution (Message from President Nixon to Congress),
W72-09486 6E

COASTS
A Guide to the Geology of Delaware's Coastal Environments,
W72-09614 2J

On the Classification and Trends of Long Period Sea Level Series,
W72-09757 7C

COBALT
A Critical study of Some Parameters in Quantitative in situ Investigations of Thin-Layer Chromatography by Light Absorption Methods,
W72-09411 5A

Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

Biogeochemical Sources of Iodine and Cobalt in Moldavia (Biogeokhimicheskiye provintsii yoda i kobalta v Moldavii),
W72-09643 2K

COHESIONLESS SOILS
Resistance of Soil to Liquefaction and Settlement,
W72-09704 8D

COLD REGIONS
Arctic Waste Management,
W72-09601 5D

COLIFORMS
Microbiological Characterization of Activated Sludge in a Wastewater Treatment Plant Chemically Modified for Phosphorous Removal,
W72-09654 5D

COLOR
The Clarification of Paper Mill Effluents by Activated Carbon Produced from Waste Sulfite Liquor and Other Refuse,
W72-09589 5D

Electrically Induced Coagulation of Lignin from Kraft Mill Wastewaters,
W72-09597 5D

Stoichiometry of the Coagulation of Color-Causing Organic Compounds with Ferric Sulfate,
W72-09695 5F

COLORADO
Bear Creek Dam and Lake, Colorado (Draft Environmental Impact Statement).
W72-09474 8A

Ground-Water Levels in the Lower Arkansas River Valley of Colorado, 1968-72.
W72-09559 4B

COLORIMETRY
Arsenate in the Western North Atlantic and Adjacent Regions,
W72-09249 5A

Iodine Colorimeter.
W72-09322 5A

COLUMBIA RIVER
Recreational Use of the Columbia River: Evaluation of Environmental Exposure,
W72-09426 6B

Studies of Sediment Transport in the Columbia River Estuary,
W72-09551 5B

Columbia River Studies, Annual Progress Report 1970-1971,
W72-09670 5C

COLUMBIA RIVER (WASH)
Methods for Evaluating Effects of Transient Conditions in Heavily Loaded and Extensively Regulated Streams,
W72-09731 5B

COLUMN CHROMATOGRAPHY
Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

COMPREHENSIVE PLANNING
How Seattle Beat Pollution,
W72-09179 5C

The Master Plan, Town of Poestenkill, N.Y., Volume 2.
W72-09300 6D

COMPUTER-AIDED DESIGN
The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

Optimizing Hydraulic Turbine and Pump/Turbine Design,
W72-09710 8C

New Techniques for Quality Control of Concrete,
W72-09712 8F

COMPUTER APPLICATIONS
The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

COMPUTER MODELS
Numerical Methods for Determining Streamlines and Isopressures for Use in Fluid-Flow Studies,
W72-09754 2F

COMPUTER PROGRAMS
Estimating Soil Moisture Depletion from Climate, Crop and Soil Data,
W72-09223 2G

Monitoring the Environment of the Nation,
W72-09230 6G

Computer Software for Wastewater Treatment Plant Design,
W72-09233 5D

COMPUTER TOWER POSITION
The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

COMPUTERS
Mass Spectrometric Isotope Ratio Measurements and Peak Area Integration using the Peak-Switching Feature of the Aei MS-902,
W72-09326 5A

CONCENTRATION
Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

CONCRETE BLOCKS
Concrete Blocks for Earth Slope Protection,
W72-09705 4A

CONCRETE CONSTRUCTION
Grouting Preplaced Aggregate to Form Concrete,
W72-09190 8F

CONCRETE CONTROL
New Techniques for Quality Control of Concrete,
W72-09712 8F

CONCRETE DAMS
Comparison of Computed and Measured Dynamic Response of Monticello Dam,
W72-09198 8A

CONCRETE DETERIORATION
Testing Methods for Concrete Durability,
W72-09702 8F

CONCRETE MIXES
New Techniques for Quality Control of Concrete,
W72-09712 8F

CONCRETE PLACING
Grouting Preplaced Aggregate to Form Concrete,
W72-09190 8F

CONCRETE TECHNOLOGY
Grouting Preplaced Aggregate to Form Concrete,
W72-09190 8F

Testing Methods for Concrete Durability,
W72-09702 8F

CONCRETE TESTING
Testing Methods for Concrete Durability,
W72-09702 8F

CONCRETES
New Techniques for Quality Control of Concrete,
W72-09712 8F

CONDENSATION
Method and Apparatus for Withdrawing Heat from Industrial Plants, Especially Power Plants,
W72-09489 5D

Methods for Clean Condensation of Atmospheric Moisture for Its Use in a Closed Ecological System,
W72-09583 5D

CONDENSER SELECTION
Condenser Selection for Various Cooling Water Systems,
W72-09739 5D

CONDENSERS
Comparison of Evaporative Losses in Various Condenser Cooling Water Systems,
W72-09735 2D

Condenser Selection for Various Cooling Water Systems,
W72-09739 5D

CONDUCTIVITY
System for Measuring Organic Content of Water,
W72-09493 5D

Ion Association and the Analysis of Precise Conductimetric Data,
W72-09544 2K

CONFERENCES
Proceedings, 1971 Technical Conference on Estuaries of the Pacific Northwest.
W72-09547 5B

Ice and Its Action on Hydraulic Structures.
W72-09623 2C

CONFINED WATER
Geochemical Study of the Ground Water of the 'Sables Inferieurs' Confined Aquifer, of the Aquitaine Basin (Etude Geochimique de la Nappe des 'Sables Inferieurs' du Bassin d'Aquitaine),
W72-09269 2F

CONNECTICUT
Hurricane Protection Project, Stratford, Connecticut (Draft Environmental Impact Statement).
W72-09478 8D

CONSERVATION OF MASS
The Economist's Approach to Pollution and Its Control,
W72-09145 6C

CONSERVATION OF MATTER
Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

CONSTRUCTION CONTROL
Development and Trail use of Acceptance Sampling Plans for Compacted Embankments,
W72-09700 8D

CONSTRUCTION JOINTS
Testing New Sewer Pipe Installations,
W72-09595 5D

CONSUMPTIVE USE
Water and Land Resources, Ouachita River Basin in Arkansas,
W72-09309 6D

Comparison of Evaporative Losses in Various Condenser Cooling Water Systems,
W72-09735 2D

CONTAINER-COPELAND PROCESS
The Clarification of Paper Mill Effluents by Activated Carbon Produced from Waste Sulfite Liquor and Other Refuse,
W72-09589 5D

CONTINENTAL SHELF
Data on Samples for Surf Clams and Ocean Quahogs,
W72-09521 7C

CONTINUOUS CULTURES
Continuously Synchronised Growth,
W72-09340 5C

CONTINUOUS FLOW CULTURES
Introductory Lecture: Prospects and Problems in Continuous Flow Culture of Micro-Organisms,
W72-09341 5C

CONVEYANCE STRUCTURES
Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 5-8.
W72-09432 8A

Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 9-11.
W72-09433 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 12-14.
W72-09434 8A

COOLING
Air Cooling for Condensation and Exhaust Heat Rejection in Large Generating Stations,
W72-09738 5D

Condenser Selection for Various Cooling Water Systems,
W72-09739 5D

COOLING PONDS
Hazelwood Power Station - Data Collection and Analysis of Cooling Pond Performance,
W72-09737 5D

COOLING TOWERS
Meteorological Effects of Cooling Tower Plumes,
W72-09305 2B

Method and Apparatus for Withdrawing Heat from Industrial Plants, Especially Power Plants,
W72-09489 5D

A Method for Predicting the Performance of Natural Draft Cooling Towers.
W72-09726 5D

Air Cooling for Condensation and Exhaust Heat Rejection in Large Generating Stations,
W72-09738 5D

Power Plant Siting, Performance, and Economics with Dry Cooling Tower Systems,
W72-09741 5D

COOLING WATER
A Method for Predicting the Performance of Natural Draft Cooling Towers.
W72-09726 5D

Comparison of Evaporative Losses in Various Condenser Cooling Water Systems,
W72-09735 2D

COOPERATIVE WATER-STUDIES PROGRAM
Water Resources Investigations in Louisiana, 1968.
W72-09225 7C

Water Resources Investigations in Iowa, 1968.
W72-09226 7C

Water Resources Investigations in Missouri, 1968.
W72-09766 7C

Water Resources Investigations in New Jersey, 1968.
W72-09767 7C

Water Resources Investigations in Minnesota, 1969.
W72-09768 7C

COPEPODS
Interspecies Conflict in Estuarine Copepods,
W72-09231 2L

Some Quantitative Feeding Patterns Exhibited by the Copepod Calanus,
W72-09248 5C

Contribution of the Study of Zooplankton in Lebanese Waters, (Contribution A L' Etude Du Zooplancton Des Eaux Libanaises),
W72-09355 5A

COPPER
Determination of Copper, Iron, and Zinc From a Single Small Sample,
W72-09243 5A

The Spectrofluorimetric Determination of Sulphide,
W72-09253 5A

Radioactive and Metallic (Copper and Zinc) Pollutants in the Scheldt Estuary (in Water, Sediment and Suspended Matter), (Les Polluants Radioactifs et Metalliques (Cuivre et Zinc) dans L'Estuaire De L'Escaut (Eaux, Sediments et Matieres en Suspension)),
W72-09455 5A

COPPER COMPOUNDS
Chalcocite Oxidation and Coupled Carbon Dioxide Fixation by Thiobacillus Ferrooxidans,
W72-09359 5C

COPPER-ON-SILICA GEL
Selective Hydrogenation of Soybean Oil. VI. Copper-on-Silica Gel Catalysts,
W72-09346 5A

CORAL
Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

COSHOCTON (OHIO)
Hydrologic Investigation of Small Watersheds in Ohio, Phase I: 1966-1969,
W72-09296 2A

COST ANALYSIS
The Seeding of Ice Saturated Layers in the Atmosphere: A Computational Study,
W72-09207 2B

Filtration of Water and Wastewater,
W72-09393 5D

COST-BENEFIT ANALYSIS
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

COST-EFFECTIVENESS
Evaluation of Single and Multiple Pass Seawater Desalination.
W72-09518 3A

COST-EFFECTIVENESS ANALYSIS
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

COST SAVINGS
The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

COSTS
Rate Philosophy,
W72-09142 6C

Evaluation of Single and Multiple Pass Seawater Desalination.
W72-09518 3A

COUNT DISTRIBUTION THEORY
All Count Distributions are not Alike,
W72-09339 7B

CRACKING
Testing Methods for Concrete Durability,
W72-09702 8F

Tensile Tests of Ferrocement,
W72-09709 8F

CRAIGHEAD COUNTY (ARK)
Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

CROP RESPONSE
Response of Rice to Phosphate Manuring in a Waterlogged Lateritic Sandy Loam of Kerala,
W72-09578 3F

On The Minimal Soil Tillage In Growing Maize Under Irrigation, (In Bulgarian),
W72-09753 3F

CROPS
The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

CROSSLINKING
Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

CRUSTACEANS
Environmental Control of the Abundance and Distribution of the Chydorid Cladocera,
W72-09458 2H

CRYSTAL GROWTH
Crystal Seed Conditioning of Calcium Carbonate Sludge,
W72-09392 5F

CRYSTAL SEED CONDITIONING
Crystal Seed Conditioning of Calcium Carbonate Sludge,
W72-09392 5F

CRYSTALS
The Design, Construction, and Use of an Ice Crystal Counter for Ice Crystal Cloud Studies by Aircraft,
W72-09209 2B

CULTURE MEDIA
A Composite Arginine Glucose Medium for the Characterization of Pseudomonas Aeruginosa and Other Gram Negative Bacilli,
W72-09320 5C

CULTURES
A Composite Arginine Glucose Medium for the Characterization of Pseudomonas Aeruginosa and Other Gram Negative Bacilli,
W72-09320 5C

Continuously Synchronised Growth,
W72-09340 5C

Response of Escherichia Coli B/r to High Concentrations of Sucrose in a Nutrient Medium,
W72-09364 5C

Mechanism of the Growth Inhibitory Effect of Cysteine on Escherichia Coli,
W72-09407 5C

CURRENT METERS
A Three-Dimensional Current Meter for Estuarine Applications,
W72-09334 2L

CYANIDE
Plating and Industrial Waste Treatment at the Expanded Plant of Fisher Body, Elyria, Ohio,
W72-09594 5D

CYANOPHYTA
Species and Individual Productivity in Phytoplankton Communities,
W72-09239 5C

CYCLES
Long-Term Cyclic Fluctuations of Atmospheric Precipitation in the USSR (Mnogoletniye tsiklicheskiye kolebaniya atmosfernykh osadkov na territorii SSSR),
W72-09747 2B

CYCLIC POLYETHERS
Selectivity of Cyclic Polyether Type Liquid Membrane Electrodes,
W72-09415 5A

CYCLING NUTRIENTS
Nutrient Flux in Estuaries,
W72-09172 5C

Controlled Eutrophication-Increasing Food Production from the Sea by Recycling Human Wastes,
W72-09378 5G

Salt Spray and Mineral Cycling in Two California Coastal Ecosystems,
W72-09605 2K

CYSTEINE
Mechanism of the Growth Inhibitory Effect of Cysteine on Escherichia Coli,
W72-09407 5C

DAIRY INDUSTRY
Membrane Processing of Cottage Cheese Whey for Pollution Abatement.
W72-09385 5D

Rapid Methods for Radioactive Environmental Monitoring in the Federal Republic of Germany, (Schnellmethoden Zur Uberwachung Der Radioaktivitat in Der Bundesrepublik Deutschland),
W72-09456 5A

Dairying in the Desert: Agricultural Innovation in Tunisia,
W72-09752 3F

DAMAGES
Float Implosion in Observation Well in Kentucky,
W72-09621 4B

DAMS
Method and Apparatus for Desilting and/or Desalting Bodies of Water,
W72-09504 4A

DATA COLLECTIONS
Eyewitness Tornado Observations Obtained with Telephone and Tape Recorder,
W72-09217 2B

Monitoring the Environment of the Nation,
W72-09230 6G

Bomex Temporary Archive Description of Available Data,
W72-09263 7C

A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

Remote Sensing Acquisition of Tracer Dye and Infrared Imagery Information and Interpretation for Industrial Discharge Management,
W72-09550 5B

Water supplies and the Land--The Elkhorn River Basin of Nebraska,
W72-09557 7C

DATA PROCESSING
Monitoring the Environment of the Nation,
W72-09230 6G

Mass Spectrometric Isotope Ratio Measurements and Peak Area Integration using the Peak-Switching Feature of the Aei MS-902,
W72-09326 5A

GC/MS/Computers,
W72-09327 2K

Remote Sensing Acquisition of Tracer Dye and Infrared Imagery Information and Interpretation for Industrial Discharge Management,
W72-09550 5B

DATING
Geologic Age of Ancient Lake Sediments of the Mologo-Sheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

DDD
The Temporary Abatement of Nuisance Species of Trichoptera with DDD (TDE) Larvicide,
W72-09412 5C

Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

DDE
Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

DDT
Possible DDT Mortality in Young Rainbow Trout,
W72-09141 5C

DDT Residues in Salinas River Sediments,
W72-09313 5B

Micro Scale Alkali Treatment for use in Pesticide Residue Confirmation and Sample Cleanup,
W72-09314 5A

Oceans as Alphabet Soup: Focus on DDT and PCB's,
W72-09409 5B

Uptake, Assimilation, and Loss of DDT Residues by Euphausia pacifica, A Euphausid Shrimp,
W72-09519 5C

Effects of Pesticides on the Life of a Water Body (K voprosu o vliyanii pestitsidov na zhizn' vodoyema),
W72-09651 5C

Effects of DDT and Hexachlorocyclohexane on Aquatic Animals (K voprosu o vliyanii DDT i geksakhlorana na vodnyye organizmy),
W72-09652 5C

Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

DDT

Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

DE BACA COUNTY (N MEX)
Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

DECISION MAKING
Pollution Prices in a General Equilibrium Model,
W72-09235 5G

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

Bear Creek Dam and Lake, Colorado (Draft Environmental Impact Statement).
W72-09474 8A

Extending the Utility of Non-Urban Water Supplies,
W72-09525 6B

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

DEGRADATION (DECOMPOSITION)
Thin Layer Chromatography and Infra-Red and Ultra-Violet Spectra of Fenthion and Seven of its Degradation Products,
W72-09182 5A

DEGRADATION PRODUCTS
Sunlight Photochemistry of Ferric Nitrilotriacetate Complexes,
W72-09379 5A

DEIONIZATION
Determination of Nanomolar Quantities of Free Amino Acids Dissolved in North Atlantic Ocean Waters,
W72-09343 5A

DELAWARE
A Guide to the Geology of Delaware's Coastal Environments,
W72-09614 2J

DELHI LAKES
Water Pollution in Delhi Lakes,
W72-09175 5C

DELVES CUP METHOD
A Modified Delves Cup Atomic Absorption Procedure for the Determination of Lead in Blood,
W72-09332 5A

DEMINERALIZATION
Wastewater Demineralization by Ion Exchange,
W72-09384 5D

DENSITY
The Relationship Between Density and Tensile Strength in Snow,
W72-09611 2C

DEODORIZATION
Biochemical Process,
W72-09502 5D

DEPTH-AREA-DURATION ANALYSIS
Atmospheric Precipitation in the Armenian SSR (Atmosfernyye osadki v Armyanskoy SSR),
W72-09746 2B

DESALINATION
Variable Orifice for Multistage Flash Evaporation or Distillation Units,
W72-09487 3A

Method and Apparatus for Desilting and/or Desalting Bodies of Water,
W72-09504 4A

Evaporation-Reverse Osmosis Water Desalination System,
W72-09506 3A

Instrumentation for In-Situ Determination of Ice Particle Size Distribution,
W72-09513 3A

Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

DESALINATION APPARATUS
Development of Cellulose Triacetate Hollow Fiber Reverse Osmosis Modules for Brackish Water Desalination,
W72-09517 3A

DESALINATION PLANTS
The Potential Contribution of Desalting to Future Water Supply in New Mexico,
W72-09306 3A

DESALINATION PROCESSES
The Potential Contribution of Desalting to Future Water Supply in New Mexico,
W72-09306 3A

Desalination by High Pressure Solidification of Water to Ice VI,
W72-09516 3A

Development of Cellulose Triacetate Hollow Fiber Reverse Osmosis Modules for Brackish Water Desalination,
W72-09517 3A

Evaluation of Single and Multiple Pass Seawater Desalination.
W72-09518 3A

DESERT
Pattern in Desert Perennials,
W72-09333 2I

Dairying in the Desert: Agricultural Innovation in Tunisia,
W72-09752 3F

DESIGN
The Application to Existing Plant of Recent Developments in Water Filtration,
W72-09689 5F

Condenser Selection for Various Cooling Water Systems,
W72-09739 5D

Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

DESIGN CRITERIA
Role of the Soil Conservation Service in Design of Feedlot Waste Management Facilities,
W72-09149 5G

Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

Photographic Studies of the Dunging Behavior of Pigs in Confinement,
W72-09153 5G

Waste Treatment Lagoons-State of the Art.
W72-09386 5D

Design of the Beddington Works of the London Borough of Croydon,
W72-09400 5D

DESIGN DATA
Monitoring the Environment of the Nation,
W72-09230 6G

DESILTING
Method and Apparatus for Desilting and/or Desalting Bodies of Water,
W72-09504 4A

DESTRATIFICATION
Algae Control by Mixing, Staff Report on Kezar Lake in Sutton, N.H.
W72-09304 5G

DETERGENTS
Detergents: Nutrient Considerations and Total Assessment,
W72-09169 5C

The Biodegradation of Some Sulfated Alkanolamides,
W72-09344 5B

Process for Removal of Inorganic and Organic Matter from Waste Water Systems,
W72-09500 5D

DETERMINISTIC MODEL
Optimal Distribution of Water to Irrigation Canals,
W72-09195 3F

DETRITIVORES
Energetics of Natural Populations of Freshwater Macroconsumers,
W72-09666 5C

DEUTERIUM
Deuterium Content of Snow as an Index to Winter Climate in the Sierra Nevada Area,
W72-09622 2C

DIALYSIS
The Analysis of Nitrogen Containing Polymeric Ashless Oil Dispersants by Dialysis and Alumina Chromatography,
W72-09376 5A

DIALYSIS CULTURES
Growth of Obligate Autotrophic Bacteria on Glucose in a Continuous Flow-Through Apparatus,
W72-09318 5C

DIFFUSION
Self-Diffusion of Trace Concentrations of Ce-144, Pm-147, and Eu-155 in Water Solutions,
W72-09530 5B

Applications of Some Numerical Models to Pacific Northwest Estuaries,
W72-09549 5B

DIGESTER SUPERNATANT LIQUOR
Treatment of Sewage Digester Supernatant Liquor,
W72-09488 5D

DIGITAL COMPUTERS
GC/MS/Computers,
W72-09327 2K

DIRECTORY
Coordination Directory for Planning Studies and Reports, August 1971.
W72-09273 6E

DISCHARGE MEASUREMENT
Flow Measurements of Ice-Covered Rivers in Hokkaido,
W72-09628 2C

DISCHARGE (WATER)
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

Measurements of Ice Roughness and the Effect of Ice Cover on Water Levels in Three Norwegian Rivers,
W72-09638 2C

An Analytical and Experimental Investigation of Surface Discharges of Heated Water,
W72-09729 5B

The Dissipation of Heat from Thermal Discharges,
W72-09732 5B

Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

DISCOUNT RATES
Water Treatment Plant Staging Policy,
W72-09289 5F

DISCOVERY BAY
Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

DISPERSION
The Role of the Diffuse Layer in Water-In-Oil Microemulsions,
W72-09335 5A

Self-Diffusion of Trace Concentrations of Ce-144, Pm-147, and Eu-155 in Water Solutions,
W72-09530 5B

DISSOLVED ORGANIC MATTER
Release of Dissolved Organic Matter from Natural Populations of Marine Phytoplankton,
W72-09363 5C

DISSOLVED OXYGEN
The Relative Importance of Freshwater Input, Temperature and Tidal Range in Determining Levels of Dissolved Oxygen in a Polluted Estuary,
W72-09345 5B

Insidious Alteration of the Estuarine Environment,
W72-09717 5C

DISSOLVED SOLIDS
System for Measuring Organic Content of Water,
W72-09493 5D

DISTILLATION
Variable Orifice for Multistage Flash Evaporation or Distillation Units,
W72-09487 3A

DISTRIBUTION
Interspecies Conflict in Estuarine Copepods,
W72-09231 2L

All Count Distributions are not Alike,
W72-09339 7B

Physical and Biotic Factors Affecting Euxoa Species Abundance in Western North America: A Regression Analysis,
W72-09414 2I

DISTRIBUTION PATTERNS
Pattern in Desert Perennials,
W72-09333 2I

Variations of Sulfur Isotope Ratios in Samples of Water and Air near Chicago,
W72-09336 5B

Distribution of Certain Heterotrophic Aerobic Bacteria in Eastern Mediterranean Deep-Sea Sediments, (Distribution De Certaines Bacteries Heterotrophes Aerobied Dans Les Sediments Profonds De Mediterranee Orientale),
W72-09349 5C

Oceans as Alphabet Soup: Focus on DDT and PCB's,
W72-09409 5B

Emergence of Caddisflies (Trichoptera) and Mayflies (Ephemeroptera) from Heming Lake, Manitoba,
W72-09570 5C

Emergence Trap Collections of Trichoptera from an Oregon Stream,
W72-09571 5A

DISTRIBUTIONAL
Stream Capture in Kentucky Indicated by Distributional Records of Fundulus catenatus and etheostoma spectabile,
W72-09252 4A

DITCHES
Water Table Drawdown Around an Open Ditch in Organic Soils,
W72-09268 4A

DIURNAL DISTRIBUTION
The Seasonal Selection by Temperature of Heterotrophic Bacteria in an Intertidal Sediment,
W72-09350 5C

DIVERSION STRUCTURES
Western Unit Flood Protection Project, Billings, Montana (Draft Environmental Impact Statement).
W72-09482 4A

DNEPROPETROVSK OBLAST
Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

DNIEPER RIVER
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

Effects of DDT and Hexachlorocyclohexane on Aquatic Animals (K voprosu o vliyanii DDT i geksakhlorana na vodnyye organizmy),
W72-09652 5C

DOCUMENTATION
Index of Surface-Water Records to September 30, 1970: Part 2.--South Atlantic Slope and Eastern Gulf of Mexico Basins.
W72-09224 2E

List of Organizations, Meetings, Programmes, Etc., Related to Fisheries,
W72-09262 7A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendix 17. A Bibliography.
W72-09436 8A

DOLOMITIC WATER
The Use of Sewage Effluent at South African Pulp and Paper Industries' Enstra Bleached Kraft Mill,
W72-09399 5D

DOMESTIC WASTES
The Effect of Chloroform in Sewage on the Production of Gas From Laboratory Digesters,
W72-09398 5D

Biochemical Process,
W72-09502 5D

Algal Influences on Dieoff Rates of Indicator Bacteria,
W72-09590 5D

DOMINANT ORGANISMS
Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

DON RIVER
Moisture Content of Hummocky Sands Under Pine Plantings in the Middle Don Region (Vlazhnost'bugristykh peskov pod sosnovymi nasazhdeniyami na srednem Donu),
W72-09749 2G

DRAIN SPACING
Drainage from Level and Sloping Land,
W72-09698 8B

DRAINAGE
Water Table Drawdown Around an Open Ditch in Organic Soils,
W72-09268 4A

DRAINAGE COSTS
Region 7 Launches Program to reduce Subsurface Drain Costs,
W72-09697 4A

DRAINAGE EFFECTS
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

DRAINAGE ENGINEERING
Farmers Levee and Drainage District (Draft Environmental Impact Statement).
W72-09477 4A

Western Unit Flood Protection Project, Billings, Montana (Draft Environmental Impact Statement).
W72-09482 4A

DRAINAGE WATER
Groundwater and Drainage-Water Mineralization in the Mugan-sal'yany Region (Mineralizatsiya gruntovykh i drenazhnykh vod Mugano-Sal'yanskogo massiva),
W72-09750 4B

DRAWDOWN
Water Table Drawdown Around an Open Ditch in Organic Soils,
W72-09268 4A

DREDGING
Hudson River Channel, New York--Operation and Maintenance Action (Draft Environmental Impact Statement).
W72-09483 4A

DRIFT ORGANISMS
A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

DROPS (FLUIDS)
Structure and Modification of Clouds and Fogs,
W72-09201 2B

DRY COOLING TOWER
Air Cooling for Condensation and Exhaust Heat Rejection in Large Generating Stations,
W72-09738 5D

DRY COOLING TOWERS
Power Plant Siting, Performance, and Economics with Dry Cooling Tower Systems,
W72-09741 5D

DRYING
Changed Resistance of Aspen Mesophyll as a Response to Rapid Leaf Drying, (In Russian),
W72-09775 2D

DUPUIT-FORCHHEIMER THEORY
Infill of Nuclear Rubble Chimneys by Ground Water,
W72-09617 4B

DURSBAN
Laboratory Release Rate Studies of Dursban-Polymeric Formulations, March-July 1970,
W72-09676 5B

Polymer Formulations of Dursban and Abate as Mosquito Larvicides, April - October, 1970,
W72-09720 5B

Effects of Polymer Formulations of Dursban and Abate on Non-Target Organism Populations, April - October, 1970,
W72-09721 5C

DYNAMIC RESPONSE
Comparison of Computed and Measured Dynamic Response of Monticello Dam,
W72-09198 8A

E. COLI
Comparison of Methods of Estimating the Number of Escherichia coli in Edible Mussels and the Relationship between the Presence of Salmonellae and E. coli,
W72-09319 5A

Response of Escherichia Coli B/r to High Concentrations of Sucrose in a Nutrient Medium,
W72-09364 5C

Mechanism of the Growth Inhibitory Effect of Cysteine on Escherichia Coli,
W72-09407 5C

EARTH FILL
Attorney General V. Baldwin (Noncompliance with Terms of Permit to Fill).
W72-09470 6E

EARTHQUAKES
Determination of the Zone of Origin of Tsunamis (Opredeleniye mesta vozniknoveniya tsunami),
W72-09280 2L

EASEMENTS
Cook Industries V. Carlson (Right of Summary Abatement of Private Nuisance).
W72-09471 6E

EASTERN GULF OF MEXICO BASINS
Index of Surface-Water Records to September 30, 1970: Part 2.--South Atlantic Slope and Eastern Gulf of Mexico Basins.
W72-09224 2E

ECOLOGICAL DISTRIBUTION
Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

ECOLOGY
Ecological Niches of Sympatric Phytoplankton Species,
W72-09180 5C

Bomex Temporary Archive Description of Available Data,
W72-09263 7C

Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

ECONOMIC ANALYSIS
Pollution Prices in a General Equilibrium Model,
W72-09235 5G

ECONOMIC EFFICIENCY
Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

The Economist's Approach to Pollution and Its Control,
W72-09145 6C

Economic Information for Environmental Quality Management,
W72-09147 6G

ECONOMIC FEASIBILITY
Some Economic Aspects of Rain Stimulation,
W72-09146 3B

ECONOMICS
The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Pollution: Cleaning up Costs Money,
W72-09461 5G

Evaluation of Single and Multiple Pass Seawater Desalination.
W72-09518 3A

Extending the Utility of Non-Urban Water Supplies,
W72-09525 6B

ECOSYSTEMS
Eutrophication and Aquatic Ecosystems,
W72-09156 5C

Bacterial Populations as Components of Oceanic Ecosystems,
W72-09351 5B

Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

The Distribution of Cesium, Rubidium, and Potassium in the Quasi-Marine Ecosystem of the Salton Sea,
W72-09574 5B

EDTA
Polarography of Seawater II. Complex Formation of Cadmium with EDTA,
W72-09673 5A

EFFICIENCIES
Biological Factors in Aerator Performance,
W72-09602 5D

EFFLUENT DISPOSAL
Quality of Effluent from Swine Production Areas,
W72-09151 5B

EFFLUENTS
Plan for the Management of AEC-Generated Radioactive Wastes,
W72-09424 5G

Recreational Use of the Columbia River: Evaluation of Environmental Exposure,
W72-09426 6B

The Nuclear Power Industry's Need for Rapid and Accurate Estimation of Radioactivity in the Environment,
W72-09438 5A

Rapid Determination of Gamma-Ray Emitting Radionuclides in Water (Schnelle Bestimmung Gammastrahlender Radionuklide in Wassern),
W72-09445 5A

Sampling and Analytical Systems for Measuring Environmental Radioactivity,
W72-09453 5A

Electric Power and the Environment.
W72-09529 6G

Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

Getting Representative Water Samples,
W72-09672 5A

EGESTION
Energetics of Natural Populations of Freshwater Macroconsumers,
W72-09666 5C

ELECTRIC POWER PRODUCTION
Present Status of the U.S. Program on the Solidification of High Level Wastes,
W72-09584 5D

ELECTRIC POWERPLANTS
Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

ELECTRICAL DISCHARGE
Mountain-Peak Potential-Gradient Measurements and the Andes Glow,
W72-09219 2B

ELECTRICAL STUDIES
Structure and Modification of Clouds and Fogs,
W72-09201 2B

Charging of Droplets by Impulse Corona,
W72-09212 2B

Field-Enhanced Propagation of Positive Streamers and Implications to Electrically Influenced Droplet Coalescence,
W72-09213 2B

Submicroscopic Aerosols from Electrically Stressed Water Surfaces,
W72-09214 2B

Effect of Electric Field on Charge Separation by the Falling Precipitation Mechanism in Thunderclouds,
W72-09215 2B

Miniature Whirlwinds Produced in the Laboratory by High-Voltage Electrical Discharges,
W72-09216 2B

Eyewitness Tornado Observations Obtained with Telephone and Tape Recorder,
W72-09217 2B

Point Discharge Current in Blackwell, Oklahoma, June 1969 - September 1970,
W72-09218 2B

Mountain-Peak Potential-Gradient Measurements and the Andes Glow,
W72-09219 2B

Airborne and Ground Measurements of the Atmospheric Potential Gradient During a Solar Eclipse,
W72-09220 2B

ELECTRO-OXIDATION

Electro-Oxidation of Iodine on Smooth Platinum in Aqueous Media,
W72-09245 5A

ELECTROCHEMISTRY

Electro-Oxidation of Iodine on Smooth Platinum in Aqueous Media,
W72-09245 5A

Organic Radical-Ion Salts as Selective Electrochemical Sensors,
W72-09366 5A

Selectivity of Cyclic Polyether Type Liquid Membrane Electrodes,
W72-09415 5A

ELECTRODES

Coated Wire Ion Selective Electrodes,
W72-09324 2K

Role of Solvent Extraction Parameters in Liquid Membrane Ion Selective Electrodes,
W72-09325 2K

Organic Radical-Ion Salts as Selective Electrochemical Sensors,
W72-09366 5A

Selectivity of Cyclic Polyether Type Liquid Membrane Electrodes,
W72-09415 5A

ELECTROLYSIS

Ion Association and the Analysis of Precise Conductimetric Data,
W72-09544 2K

ELECTROLYTES

The Application to Existing Plant of Recent Developments in Water Filtration,
W72-09689 5F

Measurement and Control of Particulate Matter in Filter Effluents,
W72-09693 5F

ELECTRON CAPTURE GAS CHROMATOGRAPHY

DDT Residues in Salinas River Sediments,
W72-09313 5B

Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

ELECTRON PARAMAGNETIC RESONANCE

Study of Crude Oil and Some of its High Molecular Compounds Using Electron Paramagnetic Resonance (Review),
W72-09404 5A

ELEVATION

Effect of Elevation and Rainfall on the Physicochemical Properties of the Soils of the High Ranges of Kerala,
W72-09774 2G

ELKHORN RIVER BASIN (NEB)

Water supplies and the Land--The Elkhorn River Basin of Nebraska,
W72-09557 7C

ELUTION

Simple Device for Transferring and Eluting Thin-Layer Chromatographic Fractions,
W72-09342 2K

Elution of Mineral Components Out of Dead Reed Phragmites communis Trin,
W72-09778 2H

ELYRIA (OHIO)

Plating and Industrial Waste Treatment at the Expanded Plant of Fisher Body, Elyria, Ohio,
W72-09594 5D

EMBRYONIC GROWTH STAGE

Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

EMERGENCE

Emergence of Caddisflies (Trichoptera) and Mayflies (Ephemeroptera) from Heming Lake, Manitoba,
W72-09570 5C

EMERGENCE TRAPS

Emergence Trap Collections of Trichoptera from an Oregon Stream,
W72-09571 5A

EMULSIFIERS

Oil Slick Elimination,
W72-09501 5G

EMULSIONS

The Role of the Diffuse Layer in Water-In-Oil Microemulsions,
W72-09335 5A

Removal of Inorganic Species by Liquid Membrane,
W72-09497 5D

ENCAPSULATION

Present Status of the U.S. Program on the Solidification of High Level Wastes,
W72-09584 5D

ENDRIN

Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

ENERGY BUDGET

Stream Temperature Prediction Under Reduced Flow,
W72-09259 4A

Energetics of Natural Populations of Freshwater Macroconsumers,
W72-09666 5C

ENGELMANN SPRUCE

Seasonal and Diurnal Changes in Moisture Contents and Water Deficits of Engelmann Spruce Needles,
W72-09606 2I

ENGINEERING HYDROLOGY

Problems in the Utilization of Water Resources (Problemy ispol'zovaniya vodnykh resursov).
W72-09644 8B

ENGINEERING STRUCTURES

Interoceanic Canal Studies, 1970.
W72-09430 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 1-4.
W72-09431 8A

Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 5-8.
W72-09432 8A

Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 9-11.
W72-09433 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 12-14.
W72-09434 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 15-16,
W72-09435 8A

ENGLAND

Pollution: Cleaning up Costs Money,
W72-09461 5G

ENTERIC BACTERIA

Algal Influences on Dieoff Rates of Indicator Bacteria,
W72-09590 5D

ENVIRONMENT

Monitoring the Environment of the Nation,
W72-09230 6G

Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

Determination of Plutonium in Environmental Surveillance Samples,
W72-09441 5A

Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

A Quick and Convenient Measurement Method for Surface and Liquid Contamination Using the TLD System,
W72-09451 5A

ENVIRONMENT

Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

Sampling and Analytical Systems for Measuring Environmental Radioactivity,
W72-09453 5A

ENVIRONMENTAL CONTROL

Environmental Control of the Abundance and Distribution of the Chydorid Cladocera,
W72-09458 2H

The Effect of Channelization on the Environment.
W72-09459 5G

Rights and Responsibilities of Arctic Coastal States: The Canadian View,
W72-09465 6E

ENVIRONMENTAL EFFECTS

Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

Economic Information for Environmental Quality Management,
W72-09147 6G

Effect of a Hostile Environment on Pseudomonas aeruginosa,
W72-09244 5C

Automatic Monitoring Method Using Biological Concentration for Marine Radioactive Contamination,
W72-09454 5A

The Effect of Channelization on the Environment.
W72-09459 5G

Dequeen Lake, Rolling Fork River, Arkansas (Draft Environmental Impact Statement).
W72-09462 8D

Lagoon Pond Navigation Project, Martha's Vineyard, Massachusetts (Final Environmental Impact Statement).
W72-09463 4A

Willard, Kentucky. Partial Flood Protection Plan, Dry Fork of Little Fork of Little Sandy River (Final Environmental Impact Statement).
W72-09464 8D

Gypsy Moth Suppression Project (Final Environmental Impact Statement).
W72-09466 5G

Price Branch of Little La Grue Bayou, De Witt, Arkansas--Flood Control Project (Final Environmental Impact Statement).
W72-09468 4A

Manson Unit, Chelan Division, Chief Joseph Dam Project, Washington (Final Environmental Impact Statement).
W72-09473 8C

Bear Creek Dam and Lake, Colorado (Draft Environmental Impact Statement).
W72-09474 8A

Tallulah Creek Watershed (Long Creek Portion), North Carolina (Draft Environmental Impact Statement).
W72-09475 8A

Hitson, C and L and Washburn Draws, Watershed, Texas (Draft Environmental Impact Statements).
W72-09476 4B

Farmers Levee and Drainage District (Draft Environmental Impact Statement).
W72-09477 4A

Hurricane Protection Project, Stratford, Connecticut (Draft Environmental Impact Statement).
W72-09478 8D

Dyersburg, Tennessee (Draft Environmental Impact Statement).
W72-09480 8D

Levee Unit No. L-246, Missouri River Levee System (Draft Environmental Impact Statement).
W72-09481 8D

Western Unit Flood Protection Project, Billings, Montana (Draft Environmental Impact Statement).
W72-09482 4A

Hudson River Channel, New York--Operation and Maintenance Action (Draft Environmental Impact Statement).
W72-09483 4A

Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

Stream Channelization: Conflict Between Ditchers, Conservationists,
W72-09538 6E

ENVIRONMENTAL ENGINEERING

Willard, Kentucky. Partial Flood Protection Plan, Dry Fork of Little Fork of Little Sandy River (Final Environmental Impact Statement).
W72-09464 8D

ENVIRONMENTAL GRADIENT

Bomex Temporary Archive Description of Available Data,
W72-09263 7C

Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

ENVIRONMENTAL IMPACT STATEMENTS

Dequeen Lake, Rolling Fork River, Arkansas (Draft Environmental Impact Statement).
W72-09462 8D

Lagoon Pond Navigation Project, Martha's Vineyard, Massachusetts (Final Environmental Impact Statement).
W72-09463 4A

Willard, Kentucky. Partial Flood Protection Plan, Dry Fork of Little Fork of Little Sandy River (Final Environmental Impact Statement).
W72-09464 8D

Gypsy Moth Suppression Project (Final Environmental Impact Statement).
W72-09466 5G

Price Branch of Little La Grue Bayou, De Witt, Arkansas--Flood Control Project (Final Environmental Impact Statement).
W72-09468 4A

Manson Unit, Chelan Division, Chief Joseph Dam Project, Washington (Final Environmental Impact Statement).
W72-09473 8C

Bear Creek Dam and Lake, Colorado (Draft Environmental Impact Statement).
W72-09474 8A

Tallulah Creek Watershed (Long Creek Portion), North Carolina (Draft Environmental Impact Statement).
W72-09475 8A

Hitson, C and L and Washburn Draws, Watershed, Texas (Draft Environmental Impact Statements).
W72-09476 4B

Farmers Levee and Drainage District (Draft Environmental Impact Statement).
W72-09477 4A

Hurricane Protection Project, Stratford, Connecticut (Draft Environmental Impact Statement).
W72-09478 8D

Dyersburg, Tennessee (Draft Environmental Impact Statement).
W72-09480 8D

Levee Unit No. L-246, Missouri River Levee System (Draft Environmental Impact Statement).
W72-09481 8D

Western Unit Flood Protection Project, Billings, Montana (Draft Environmental Impact Statement).
W72-09482 4A

Hudson River Channel, New York--Operation and Maintenance Action (Draft Environmental Impact Statement).
W72-09483 4A

ENVIRONMENTAL POLLUTION

Pollution Prices in a General Equilibrium Model,
W72-09235 5G

ENVIRONMENTAL PROTECTION

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

ENVIRONMENTAL QUALITY

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

ENVIRONMENTAL SANITATION

President's Message--Environmental Protection,
W72-09460 6E

ENZYMES

Nucleic Acid Enzyme Studies of Nonfermentative Gram-Negative Bacteria Using Thin-Layer Chromatography,
W72-09408 5A

EQUILIBRIUM ANALYSIS

Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

EQUIPMENT
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

Float Implosion in Observation Well in Kentucky,
W72-09621 4B

EQUITABLE APPORTIONMENT
Rate Philosophy,
W72-09142 6C

ERODIBILITY
Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

EROSION
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

Permafrost Erosion Along the Beaufort Sea Coast,
W72-09546 2J

Reconnaissance Study of Sediment Transported by Streams, Island of Oahu,
W72-09759 2J

EROSION CONTROL
Chemical Stabilization of Soils,
W72-09191 8D

Water Erosion of Soils in the Ob' River Region Near Novosibirsk (Vodnaya eroziya pochv Novosibirskogo Priob'ya),
W72-09281 2J

Proceedings - Workshop on Sediment Control.
W72-09656 4D

Concrete Blocks for Earth Slope Protection,
W72-09705 4A

Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

EROSION RATES
Water Erosion of Soils in the Ob' River Region Near Novosibirsk (Vodnaya eroziya pochv Novosibirskogo Priob'ya),
W72-09281 2J

ESTIMATING
Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

ESTIMATING EQUATIONS
Best Linear Unbiased Estimates of the Parameters of the Logistic Distribution Based on Selected Order Statistics,
W72-09348 7C

On Bias Reduction in Estimation,
W72-09358 7C

ESTONIAN SSR
Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

ESTUARIES
Nutrient Management in the Potomac Estuary,
W72-09171 5C

Nutrient Flux in Estuaries,
W72-09172 5C

Animal-Sediment Relations and Community Analysis of a Florida Estuary,
W72-09177 5C

The Benthic Macrofauna of Moriches Bay, New York,
W72-09181 5C

A Three-Dimensional Current Meter for Estuarine Applications,
W72-09334 2L

Fallout Cesium-137 in Clams (Rangia Cuneata) From the Neuse River Estuary, North Carolina,
W72-09337 5A

The Relative Importance of Freshwater Input, Temperature and Tidal Range in Determining Levels of Dissolved Oxygen in a Polluted Estuary,
W72-09345 5B

Release of Dissolved Organic Matter from Natural Populations of Marine Phytoplankton,
W72-09363 5C

Attorney General V. Baldwin (Noncompliance with Terms of Permit to Fill).
W72-09470 6E

Proceedings, 1971 Technical Conference on Estuaries of the Pacific Northwest.
W72-09547 5B

The Potential of Physical Models to Investigate Estuarine Water Quality Problems,
W72-09548 5B

Applications of Some Numerical Models to Pacific Northwest Estuaries,
W72-09549 5B

Studies of Sediment Transport in the Columbia River Estuary,
W72-09551 5B

Design and Construction of a Saltwater Environment Simulator,
W72-09553 5C

Insidious Alteration of the Estuarine Environment,
W72-09717 5C

ESTUARINE BIVALVES
Upper Temperature Tolerances of Some Estuarine Bivalves,
W72-09734 5C

ESTUARINE ENVIRONMENT
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

Bioluminescence and Primary Productivity in Marine Estuarine Environments,
W72-09575 5C

Phosphorus and Eutrophication in the Pamlico River Estuary, N. C., 1966-1969 - A Summary,
W72-09655 5C

Insidious Alteration of the Estuarine Environment,
W72-09717 5C

Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

ETHER EXTRACTABLE MATERIAL
The Effects of Oil on Sewers and Treatment Plants,
W72-09395 5D

EUPHAUSID SHRIMP
Uptake, Assimilation, and Loss of DDT Residues by Euphausia pacifica, A Euphausid Shrimp,
W72-09519 5C

EUROPE
The Fountains of Rome,
W72-09380 8A

Pollution: Cleaning up Costs Money,
W72-09461 5G

EUTROPHICATION
Nutrients and Eutrophication: The Limiting Nutrient Controversy.
W72-09155 5C

Eutrophication and Aquatic Ecosystems,
W72-09156 5C

Algal Responses to Nutrient Additions in Natural Waters. II. Field Experiments,
W72-09165 5C

Phosphorus, Silica, and Eutrophication of Lake Michigan,
W72-09166 5C

Natural Carbon Sources, Rates of Replenishment, and Algal Growth,
W72-09168 5C

Detergents: Nutrient Considerations and Total Assessment,
W72-09169 5C

Wastewater Treatment and Eutrophication,
W72-09170 5C

Nutrient Management in the Potomac Estuary,
W72-09171 5C

The Benthic Macrofauna of Moriches Bay, New York,
W72-09181 5C

Algae Control by Mixing, Staff Report on Kezar Lake in Sutton, N.H.
W72-09304 5G

Controlled Eutrophication-Increasing Food Production from the Sea by Recycling Human Wastes,
W72-09378 5G

Phosphorus and Eutrophication in the Pamlico River Estuary, N. C., 1966-1969 - A Summary,
W72-09655 5C

EUXOA
Physical and Biotic Factors Affecting Euxoa Species Abundance in Western North America: A Regression Analysis,
W72-09414 2I

EVALUATION
The Determination of Nitrilotriacetic Acid (NTA) In Sewage and Sewage Effluent,
W72-09251 5A

Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

EVAPORATION
Evaporation-Reverse Osmosis Water Desalination System,
W72-09506 3A

A Comparison of Mass-Transfer and Climatic-Index Evaporation Computations from Small Reservoirs in Texas,
W72-09555 2H

Comparison of Evaporative Losses in Various Condenser Cooling Water Systems,
W72-09735 2D

Heat Dissipation at Power Plant Cooling Lakes,
W72-09736 2D

EVAPORATION CONTROL
Water Budget Analysis of a New England Wetland,
W72-09265 3B

EVAPOTRANSPIRATION
Chaparral Treatment Effects on Streamflow,
W72-09604 3B

EXCAVATION
Public Safety and Underground Nuclear Detonations,
W72-09427 5G

EXCAVATORS
Region 7 Launches Program to reduce Subsurface Drain Costs,
W72-09697 4A

EXPERIMENTAL WATERSHEDS
Chaparral Treatment Effects on Streamflow,
W72-09604 3B

EXPLOITATION
U.N. Adopts Principles Governing Seabed Exploitation and Decides to Convene Comprehensive Law-of-the-Sea Conference in 1973.
W72-09484 6E

EXPLOSIVES
Analysis of Explosives in Sea Water,
W72-09312 5A

EXTERNALITIES
Externalities and Public Goods,
W72-09143 6A

Closing Circle on Environmental Economics,
W72-09144 6E

Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

EXTRACTION TECHNIQUES
A Method for the Analysis of Fish, Animal, and Pultry Tissue for Chlorinated Pesticide Residues,
W72-09684 5A

EXTRATERRESTRIAL EFFECTS (METEOROLOGICAL)
Considerations Regarding Solar and Lunar Modulation of Geophysical Parameters, Atmospheric Electricity and Thunderstorms,
W72-09221 2B

FACULTATIVE LAGOONS
Waste Treatment Lagoons-State of the Art.
W72-09386 5D

FALLOUT
Penetration of Bog Peats and Lake Sediments by Tritium From Atmospheric Fallout,
W72-09240 5B

Fallout Cesium-137 in Clams (Rangia Cuneata) From the Neuse River Estuary, North Carolina,
W72-09337 5A

Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

Environmental Radioactivity in New Zealand. Quarterly Report, Oct.-Dec. 1970.
W72-09429 5A

The Nuclear Power Industry's Need for Rapid and Accurate Estimation of Radioactivity in the Environment,
W72-09438 5A

Rapid Evaluation of Radioactive Samples by Gamma-Ray Spectrometry,
W72-09446 5A

Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

Rapid Methods for Radioactive Environmental Monitoring in the Federal Republic of Germany, (Schnellmethoden Zur Uberwachung Der Radioaktivitat in Der Bundesrepublik Deutschland),
W72-09456 5A

Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

FARM WASTES
Role of the Soil Conservation Service in Design of Feedlot Waste Management Facilities,
W72-09149 5G

Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

Quality of Effluent from Swine Production Areas,
W72-09151 5B

Photographic Studies of the Dunging Behavior of Pigs in Confinement,
W72-09153 5G

FARMERS LEVEE AND DRAINAGE DISTRICT (ILL.)
Farmers Levee and Drainage District (Draft Environmental Impact Statement).
W72-09477 4A

FARMS
The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

FATE OF POLLUTANTS
Mathematical Model for Fate of Pollutants in Near-Shore Waters,
W72-09377 5B

FATTY ACIDS
Gas Chromatographic Analysis of the Higher Fatty Acids of the Alga Chlorella Vulgaris (Pyrenoidosa),
W72-09365 5A

FATTY ALCOHOLS
Lanthanide Shift Reagents as an Aid in the NMR Analysis of the Normal Alcohols C6 to C11,
W72-09347 5A

FEASIBILITY STUDIES
Interoceanic Canal Studies, 1970.
W72-09430 8A

FECUNDITY
A New Species of Troglobitic Asellid From Illinois,
W72-09520 5C

FEDERAL GOVERNMENT
President's Message--Environmental Protection,
W72-09460 6E

Offshore Oil Pollution (Message from President Nixon to Congress),
W72-09486 6E

FEEDING BEHAVIOR
Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

FEEDING PATTERNS
Some Quantitative Feeding Patterns Exhibited by the Copepod Calanus,
W72-09248 5C

FEEDLOT RUNOFF
Role of the Soil Conservation Service in Design of Feedlot Waste Management Facilities,
W72-09149 5G

FERN LAKE (WASH)
Ecological Dynamics of Watersheds,
W72-09565 2A

FERRIC CHLORIDE
Decontamination of Radioactive Aqueous Effluent by the Calcium-Ferric Phosphate Process,
W72-09692 5F

FERROCEMENT
Tensile Tests of Ferrocement,
W72-09709 8F

FERROFLUIDS
Process for Cleaning up Oil Spills,
W72-09490 5G

FERTILIZERS
Response of Rice to Phosphate Manuring in a Waterlogged Lateritic Sandy Loam of Kerala,
W72-09578 3F

FIBER GLASS
Experimental Evaluation of Fibrous Bed Coalescers for Separating Oil-Water Emulsions.
W72-09580 5D

FIBROUS BEDS
Experimental Evaluation of Fibrous Bed Coalescers for Separating Oil-Water Emulsions.
W72-09580 5D

FILTERS
Filtration of Water and Wastewater,
W72-09393 5D

The Application to Existing Plant of Recent Developments in Water Filtration,
W72-09689 5F

FILTRATION
Wastewater Demineralization by Ion Exchange,
W72-09384 5D

Activated Sludge Processing.
W72-09389 5D

Filtration of Water and Wastewater,
W72-09393 5D

The Operation of Pressure Type Sand Filters for Hot Mill Waste Waters,
W72-09587 5D

Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

The Application to Existing Plant of Recent Developments in Water Filtration,
W72-09689 5F

Measurement and Control of Particulate Matter in Filter Effluents,
W72-09693 5F

FINAL CLARIFIERS
A Mathematical Model of a Final Clarifier.
W72-09382 5D

FISH
Chlorinated Municipal Waste Toxicities to Rainbow Trout and Fathead Minnows.
W72-09154 5C

Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

Selected Terms Used in Fish Culture,
W72-09261 7A

Methods for Evaluating Effects of Transient Conditions in Heavily Loaded and Extensively Regulated Streams,
W72-09731 5B

FISH CULTURE TERMINOLOGY
Selected Terms Used in Fish Culture,
W72-09261 7A

FISH DISEASES
Infectious Pancreatic Necrosis Virus: Comparative Frequencies of Isolation From Feces and Organs of Brook Trout (Salvelinus fontinalis),
W72-09152 5A

Selected Terms Used in Fish Culture,
W72-09261 7A

FISH EGGS
Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

FISH FARMING
High Density Fish Culture.
W72-09522 6B

Manual on the Biotechnology of the Propagation and Rearing of Phytophagous Fishes.
W72-09722 8I

FISH FOOD
Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

FISH MANAGEMENT
High Density Fish Culture.
W72-09522 6B

FISH TAINTING
Kerosene-Like Tainting in Australian Mullet,
W72-09678 5C

FISH TAXONOMY
Selected Terms Used in Fish Culture,
W72-09261 7A

FISH TYPES
Selected Terms Used in Fish Culture,
W72-09261 7A

FISHERIES
Selected Terms Used in Fish Culture,
W72-09261 7A

List of Organizations, Meetings, Programmes, Etc., Related to Fisheries,
W72-09262 7A

Present State and Development of Scientific Research on Prevention of Fishery Pollution (Sostoyaniye i perspektivy nauchno-issledovatel'skikh rabot po probleme okhrany rybokhozyaystvennykh vodoyemov ot zagryazneniya),
W72-09648 5C

Potential Uses of Waste Waters and Heated Effluents,
W72-09733 5B

FISHKILL
Possible DDT Mortality in Young Rainbow Trout,
W72-09141 5C

FLAME IONIZATION DETECTORS
More Accurate Gas-Chromatographic Analysis Using Flame-Ionization Detector,
W72-09373 5A

FLASH DISTILLATION
Variable Orifice for Multistage Flash Evaporation or Distillation Units,
W72-09487 3A

FLASH FLOODS
Sedimentary Structures Formed by Flash Floods in Southern Israel,
W72-09540 2J

FLOATS (OBSERVATION WELL)
Float Implosion in Observation Well in Kentucky,
W72-09621 4B

FLOCCULATION
Flotation of Solids from Waste Waters,
W72-09496 5D

Flocculation of Particles Dispersed in Aqueous Media and Flocculants Used Therein,
W72-09505 5D

FLOOD CONTROL
Dequeen Lake, Rolling Fork River, Arkansas (Draft Environmental Impact Statement).
W72-09462 8D

Willard, Kentucky. Partial Flood Protection Plan, Dry Fork of Little Fork of Little Sandy River (Final Environmental Impact Statement).
W72-09464 8D

Levee Unit No. L-246, Missouri River Levee System (Draft Environmental Impact Statement).
W72-09481 8D

Break-Up and Control of River Ice,
W72-09642 2C

FLOOD DAMAGE
Summary of Floods in the United States During 1967,
W72-09222 2E

The Virginia Flood of 1969,
W72-09760 2E

FLOOD PLAINS
Patterns of Use of a Flood Plain by Zambian Mammals,
W72-09724 2I

FLOOD PROTECTION
Price Branch of Little La Grue Bayou, De Witt, Arkansas--Flood Control Project (Final Environmental Impact Statement).
W72-09468 4A

Bear Creek Dam and Lake, Colorado (Draft Environmental Impact Statement).
W72-09474 8A

Tallulah Creek Watershed (Long Creek Portion), North Carolina (Draft Environmental Impact Statement).
W72-09475 8A

Hitson, C and L and Washburn Draws, Watershed, Texas (Draft Environmental Impact Statements).
W72-09476 4B

Farmers Levee and Drainage District (Draft Environmental Impact Statement).
W72-09477 4A

Hurricane Protection Project, Stratford, Connecticut (Draft Environmental Impact Statement).
W72-09478 8D

Dyersburg, Tennessee (Draft Environmental Impact Statement).
W72-09480 8D

FLOODS
Summary of Floods in the United States During 1967,
W72-09222 2E

The Virginia Flood of 1969,
W72-09760 2E

FLORIDA
Availability of Ground Water for Public-Water Supply in the Pensacola Area, Florida,
W72-09267 4B

A Statutory Analysis of Florida's Water Pollution Control Legislation,
W72-09479 6E

FLORIDA

Nitrogen Fixation by Bacteria in Lake Mize, Florida, and in Some Lacustrine Sediments,
W72-09579 5C

FLOTSAM

Apparatus for Controlling the Dispersion of Pollutants Floating on a Body of Water,
W72-09494 5G

Method of and Apparatus for Skimming Flotsam from the Surface of a Body of Water,
W72-09499 5G

FLOW

Hydro-Physiographic Model,
W72-09234 6A

Asymptotic Theory of Helical Waves on a Gaseous Jet in a Rotating Viscous Fluid,
W72-09237 2E

Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

FLOW AROUND OBJECTS

Initiation of Ripples by Artificial Disturbances,
W72-09260 2J

Theoretical Analysis of Flow Past Leaf Gate,
W72-09274 8B

FLOW CHARACTERISTICS

Vertical Profiles of Windspeed in a Pine Stand,
W72-09609 2I

FLOW MEASUREMENT

An Inexpensive Heated Thermistor Anemometer,
W72-09610 2D

FLOW PROFILES

Numerical Methods for Determining Streamlines and Isopressures for Use in Fluid-Flow Studies,
W72-09754 2F

FLOW RATES

Organic Concentration and Hydraulic Loading Versus Organic Loading in Evaluation of Trickling Filter Performance,
W72-09596 5D

FLUCTUATIONS

Long-Term Cyclic Fluctuations of Atmospheric Precipitation in the USSR (Mnogoletniye tsiklicheskiye kolebaniya atmosfernykh osadkov na territorii SSSR),
W72-09747 2B

FLUORESCENCE

Nucleic Acid Enzyme Studies of Nonfermentative Gram-Negative Bacteria Using Thin-Layer Chromatography,
W72-09408 5A

FLUORESCENT INDICATOR ADSORPTION

Displacement Chromatography of Hydrocarbons,
W72-09563 5A

FLUX DENSITY

Magnetic Flocculation of Steel Mill Waste Waters,
W72-09585 5D

FOOD AND DRUG ADMINISTRATION

Heavy Metals in United States Fish,
W72-09719 5B

FOOD CHAINS

Bacterial Populations as Components of Oceanic Ecosystems,
W72-09351 5B

Pollutants and Food-Chains,
W72-09402 5C

Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

Rapid Methods for Radioactive Environmental Monitoring in the Federal Republic of Germany, (Schnellmethoden Zur Uberwachung Der Radioaktivitat in Der Bundesrepublik Deutschland),
W72-09456 5A

Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

The Relationships Between 32P Accumulation in Algae, Bacteria and Tubificids,
W72-09668 5C

FOOD PROCESSING INDUSTRY

Effects of Incubation Temperature on the Salt Tolerance of Salmonella,
W72-09371 5C

Liquid Wastes from Canning and Freezing Fruits and Vegetables.
W72-09390 5D

Cost of Waste Treatment in the Meat Packing Industry,
W72-09397 5D

Handling Waste Disposal at a Major Food Plant,
W72-09591 5D

FORECASTING

Mathematical Model for Fate of Pollutants in Near-Shore Waters,
W72-09377 5B

Prediction of the Florida Red Tide by Means of the Iron Index; Red Tide, Iron and Humic Acid Levels in Streams.
W72-09524 5B

Agricultural Water Demands,
W72-09526 6D

A Method for Predicting the Performance of Natural Draft Cooling Towers.
W72-09726 5D

Mathematical Models for the Prediction of Thermal Energy Changes in Impoundments.
W72-09727 5B

Research on the Physical Aspects of Thermal Pollution.
W72-09728 5B

Hazelwood Power Station - Data Collection and Analysis of Cooling Pond Performance,
W72-09737 5D

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

FOREIGN COUNTRIES

Pollution: Cleaning up Costs Money,
W72-09461 5G

FORENSIC BIOLOGY

Polluted Water: A Challenge to Forensic Biology,
W72-09498 5G

FOULING

Experimental Study of the Fouling Process at Sea,
W72-09564 5A

FOUNDRIES

The Treatment of Industrial Wastewater for Reuse--Chrysler Indianapolis Foundry,
W72-09600 5D

FRAMES

Seismic Resistance of Prestressed Concrete Beam-Column Assemblies,
W72-09713 8F

FRANCE

Environmental Radioactivity in New Zealand. Quarterly Report, Oct.-Dec. 1970.
W72-09429 5A

FRAZIL ICE

Calculation of Frazil Ice Production,
W72-09629 2C

Investigations into Frazil, Bottom Ice and Surface Ice Formation in the Niagara River,
W72-09632 2C

Change of Velocity Distribution in a Cross-Section of a Freezing River and the Effect of Frazil Ice Loading on Velocity Distribution,
W72-09636 2C

Ice Conditions in the Thjorsa River System,
W72-09641 2C

FREE SURFACES

Asymptotic Theory of Helical Waves on a Gaseous Jet in a Rotating Viscous Fluid,
W72-09237 2E

FREEZING

Experimental Studies of Freezing, Wake Effect, and Breakup of Freely Suspended Supercooled Water Drops,
W72-09204 2B

Theory of Hail Growth,
W72-09205 2B

Estimation of the Occurrence of Hail and Hailstone Sizes,
W72-09206 2B

Instrumentation for In-Situ Determination of Ice Particle Size Distribution,
W72-09513 3A

River and Coastal Ice Problems in Iceland,
W72-09624 2C

The Iowa Low Temperature Flow Facility,
W72-09627 2C

Investigations into Frazil, Bottom Ice and Surface Ice Formation in the Niagara River,
W72-09632 2C

Heat Exchanges and Frazil Formation,
W72-09633 2C

Formation of Primary Ice Layers,
W72-09635 2C

A Study on the Formation of the River Ice in a Snow Area,
W72-09637 2C

FREQUENCY
Comparison of Computed and Measured Dynamic Response of Monticello Dam,
W72-09198 8A

FRESHWATER
Determination of the Toxicity of Contaminated Freshwater with Respect to Certain Hydrobionts (Opredeleniye toksichnosti zagryaznennykh presnykh vod v otnoshenii nekotorykh gidrobiontov),
W72-09649 5C

FRESHWATER FISH
A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

FUELS
Effects of Petroleum Fractions on the Early Development of a Sea Urchin,
W72-09677 5C

FUNGI
Methylation of Pentachlorophenol by Trichoderma Virgatum,
W72-09562 5B

FURFURAL
Gas-Liquid Chromatographic Determination of Furfural in Aqueous Solution,
W72-09403 5A

GAGING STATIONS
Index of Surface-Water Records to September 30, 1970: Part 2.--South Atlantic Slope and Eastern Gulf of Mexico Basins.
W72-09224 2E

Characteristics of Streamflow at Gaging Stations in Shell Creek, Elkhorn River, and Salt Creek Basins, Nebraska,
W72-09556 2E

GALLUP
The Potential Contribution of Desalting to Future Water Supply in New Mexico,
W72-09306 3A

GAS CHROMATOGRAPHY
Analysis of Explosives in Sea Water,
W72-09312 5A

Micro Scale Alkali Treatment for use in Pesticide Residue Confirmation and Sample Cleanup,
W72-09314 5A

Column Extraction of Pesticides from Fish, Fish Food and Mud,
W72-09315 5A

Determination of Carbetamide Residues and its Aniline Metabolite,
W72-09316 5A

Appearance of 1-Hydroxychlordene in Soil Crops, and Fish,
W72-09317 5A

Hydrolysis and Solvent Partition of Phosdrin and Related Organophosphates,
W72-09321 5B

Simple Device for Introduction of Mass Calibrant into a Gas Chromatograph-Mass Spectrometer System,
W72-09323 2K

GC/MS/Computers,
W72-09327 2K

Determination of Nanomolar Quantities of Free Amino Acids Dissolved in North Atlantic Ocean Waters,
W72-09343 5A

Improved Continuous Radio Gas Chromatography of Hydrogen-3-- and Carbon-14--Labelled Compounds Using Hydrocracking,
W72-09352 5A

The Determination of Traces of Nickel by Gas-Liquid Chromatography,
W72-09369 5A

More Accurate Gas-Chromatographic Analysis Using Flame-Ionization Detector,
W72-09373 5A

The Analysis of Nitrogen Containing Polymeric Ashless Oil Dispersants by Dialysis and Alumina Chromatography,
W72-09376 5A

Gas-Liquid Chromatographic Determination of Furfural in Aqueous Solution,
W72-09403 5A

Analysis of Small Quantities of Saccharides in Aqueous Effluents,
W72-09419 5A

Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

Determination of Nitrilotriacetic acid in Inland Waters by Gas Chromatography of the Trimethyl Ester,
W72-09711 5A

GAS LIQUID CHROMATOGRAPHY
Gas Chromatographic Analysis of the Higher Fatty Acids of the Alga Chlorella Vulgaris (Pyrenoidosa),
W72-09365 5A

GAS SOLID CHROMATOGRAPHY
Gas-Solid Chromatography of Organic Compounds using Steam as the Carrier Gas,
W72-09566 5A

GAS SPARGING
The Effects of Cobalt-60 Radiation on Textile Processing Waste,
W72-09391 5D

GASES
Partial Pressure of Gases Dissolved at Great Depth,
W72-09537 1B

The Responses of Molinia Caerulea and Erica tetralix to Soil Aeration and Related Factors. III. Effects of Different Gas Concentrations on Growth in Solution Culture; and General Conclusions,
W72-09572 2I

GASTINEAU CHANNEL (ALASKA)
Status Report on the Gastineau Channel Model Study,
W72-09762 8B

GATES
Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 9-11.
W72-09433 8A

Method and Apparatus for Desilting and/or Desalting Bodies of Water,
W72-09504 4A

GENETICS
Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

GEOCHEMISTRY
Biogeochemistry of Lakes: Major Substances,
W72-09157 5C

Geochemical Study of the Ground Water of the 'Sables Inferieurs' Confined Aquifer, of the Aquitaine Basin (Etude Geochimique de la Nappe des 'Sables Inferieurs' du Bassin d'Aquitaine),
W72-09269 2F

Biogeochemical Sources of Iodine and Cobalt in Moldavia (Biogeokhimicheskiye provintsii yoda i kobalta v Moldavii),
W72-09643 2K

GEOLOGY
Glaciers and Geological Evolution of the Earth (Oledeneniya i geologicheskoye razvitiye zemli),
W72-09279 2C

GEORGIA
Release of Dissolved Organic Matter from Natural Populations of Marine Phytoplankton,
W72-09363 5C

GERMANY
Rapid Methods for Radioactive Environmental Monitoring in the Federal Republic of Germany, (Schnellmethoden Zur Uberwachung Der Radioaktivitat in Der Bundesrepublik Deutschland),
W72-09456 5A

GERMINATION
Effect of Osmotic and Matric Potentials on the Availability of Water for Seed Germination,
W72-09773 2I

Influence of Soil Water Matric Potential and Hydraulic Conductivity on the Germination of Rape (Brassica napus L.),
W72-09780 3F

GLACIAL CYCLES
Glaciers and Geological Evolution of the Earth (Oledeneniya i geologicheskoye razvitiye zemli),
W72-09279 2C

GLACIAL LAKES
Geologic Age of Ancient Lake Sediments of the Mologo-Sheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

GLACIAL MAXIMUM
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

GLACIAL SEDIMENTS
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

Geologic Age of Ancient Lake Sediments of the MologoySheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

GLACIATION
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

Glaciers and Geological Evolution of the Earth (Oledeneniya i geologicheskoye razvitiye zemli),
W72-09279 2C

Geologic Age of Ancient Lake Sediments of the Mologo-Sheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

GLACIERS
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

Glaciers and Geological Evolution of the Earth (Oledeneniya i geologicheskoye razvitiye zemli),
W72-09279 2C

GLACIOLOGY
Glaciers and Geological Evolution of the Earth (Oledeneniya i geologicheskoye razvitiye zemli),
W72-09279 2C

GLUCOSE
Growth of Obligate Autotrophic Bacteria on Glucose in a Continuous Flow-Through Apparatus,
W72-09318 5C

GOVERNMENTAL INTERRELATIONS
U.S. Opposes Unilateral Extension by Canada of High Seas Jurisdiction.
W72-09472 6E

GRANT COUNTY (NEW MEXICO)
Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

GRASS-M
Perennial Grass Mixtures for Hay-Pasture Use of Low-Productive and Eroded Lands Under Dry Farming Conditions, (In Bulgarian),
W72-09772 3F

GRAVITY STUDIES
Mapping Buried Bedrock Topography With Gravity,
W72-09618 2F

Ground-Water Volumes from Anomalous Mass Determinations for Alluvial Basins,
W72-09619 2F

GREASE
The Effects of Oil on Sewers and Treatment Plants,
W72-09395 5D

GREAT LAKES
Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

GREAT MIAMI RIVER
Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

GREENE COUNTY (ARK)
Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

GROUND WATER
Oil Spill Removal Method,
W72-09510 5G

GROUNDWATER
Geology and Ground-Water Resources of Northwestern North Carolina,
W72-09264 4B

Availability of Ground Water for Public-Water Supply in the Pensacola Area, Florida,
W72-09267 4B

Rural Water Supply in the Basement Complex of Western State, Nigeria,
W72-09275 3B

Ground-Water Levels in the Lower Arkansas River Valley of Colorado, 1968-72.
W72-09559 4B

Groundwater and Drainage-Water Mineralization in the Mugan-sal'yany Region (Mineralizatsiya gruntovykh i drenazhnykh vod Mugano-Sal'yanskogo massiva),
W72-09750 4B

Use of Groundwater for Irrigation in Clay County, Nebraska, 1970,
W72-09756 4B

Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

Analysis of the Ground-Water System by Electrical-Analog Model, Avra Valley, Pima and Pinal Counties, Arizona,
W72-09765 7C

GROUNDWATER AVAILABILITY
Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

GROUNDWATER HYDRAULICS
Ground-Water Hydraulics,
W72-09769 2F

GROUNDWATER MOVEMENT
Natural Isotopes in the Groundwater of the Tulum Valley, San Juan, Argentina,
W72-09276 2F

Groundwater Flow in Calcareous Aquifers in the Vicinity of Barcelona, Spain,
W72-09277 2F

Electrical Analog Model Study of Water in Guayama Area, Puerto Rico: Phase 1 -- Assembling Data for the Analog Model,
W72-09543 2F

Infill of Nuclear Rubble Chimneys by Ground Water,
W72-09617 4B

Numerical Methods for Determining Streamlines and Isopressures for Use in Fluid-Flow Studies,
W72-09754 2F

Ground-Water Hydraulics,
W72-09769 2F

GROUNDWATER RESOURCES
Ground-Water Resources of Cache Valley, Utah and Idaho,
W72-09558 4B

GROWTH RATES
Natural Carbon Sources, Rates of Replenishment, and Algal Growth,
W72-09168 5C

Water Treatment Plant Staging Policy,
W72-09289 5F

Growth of Obligate Autotrophic Bacteria on Glucose in a Continuous Flow-Through Apparatus,
W72-09318 5C

Continuously Synchronised Growth,
W72-09340 5C

Introductory Lecture: Prospects and Problems in Continuous Flow Culture of Micro-Organisms,
W72-09341 5C

Response of Escherichia Coli B/r to High Concentrations of Sucrose in a Nutrient Medium,
W72-09364 5C

Factors Involved in the Isolation of Clostridium Perfringens,
W72-09370 5A

Mechanism of the Growth Inhibitory Effect of Cysteine on Escherichia Coli,
W72-09407 5C

Experimental Study of the Fouling Process at Sea,
W72-09564 5A

GUAYAMA (P.R.)
Electrical Analog Model Study of Water in Guayama Area, Puerto Rico: Phase 1 -- Assembling Data for the Analog Model,
W72-09543 2F

GULF OF SAN MATIAS
Malacological Resources of the Gulf of San Matias with some Observations made in the Exploratory Campaign SAO-I-71,
W72-09708 2L

GYPSY MOTH
Gypsy Moth Suppression Project (Final Environmental Impact Statement).
W72-09466 5G

HADAMARD-TRANSFORM SPECTROMETRY
Hadamard-Transform Spectrometry: A New Analytical Technique,
W72-09418 2K

HAIL
Theory of Hail Growth,
W72-09205 2B

Estimation of the Occurrence of Hail and Hailstone Sizes,
W72-09206 2B

HARBORS
Selection of Scale for Riprap Model of In-Shore Harbor, Site X. Analytical Investigation,
W72-09615 8B

HARDNESS (WATER)
The Role of Carbon in Hard-Water Marl Lakes,
W72-09161 5C

HAWAII
The Approximate Theories of Pneumatic Wave Generators,
W72-09541 8B

Reconnaissance Study of Sediment Transported by Streams, Island of Oahu,
W72-09759 2J

HEAT BALANCE
Topographic Effects Apparent in Nocturnal Temperature Profiles in a Conifer Canopy,
W72-09608 2D

HEAT BUDGET
The Dissipation of Heat from Thermal Discharges,
W72-09732 5B

HEAT DISSIPATION
The Dissipation of Heat from Thermal Discharges,
W72-09732 5B

Heat Dissipation at Power Plant Cooling Lakes,
W72-09736 2D

HEAT EXCHANGERS
Air Cooling for Condensation and Exhaust Heat Rejection in Large Generating Stations,
W72-09738 5D

HEAT RESISTANCE
The Effect of Temperature on the Feeding Rate and Behavior of the Caddisfly Hydropsyche frisoni,
W72-09686 5C

Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

HEATED GRAPHITE ATOMIZER
The Determination of Calcium in the 0.1 to 10 NG Region by Atomic Absorption Spectroscopy with the Heated Graphite Atomizer,
W72-09329 5A

HEATED WATER
Kinetics of OH Radical Reactions in Irradiated Ordinary and Supercooled Water,
W72-09428 5B

Method and Apparatus for Withdrawing Heat from Industrial Plants, Especially Power Plants,
W72-09489 5D

An Analytical and Experimental Investigation of Surface Discharges of Heated Water,
W72-09729 5B

Potential Uses of Waste Waters and Heated Effluents,
W72-09733 5B

Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

HEAVY METALS
Determination of Copper, Iron, and Zinc From a Single Small Sample,
W72-09243 5A

Determination of Antimony in Geological Materials by Atomic Absorption Spectrometry,
W72-09328 5A

A Comparison of Some Ready-For-Use Thin Layers for the Separation of Heavy Metals with Butanol-3 N HCl,
W72-09353 5A

Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

Migration and Leaching of Metals from Old Mine Tailings Deposits,
W72-09620 5B

Monitoring Metals in Marine Animals,
W72-09718 5A

Heavy Metals in United States Fish,
W72-09719 5B

HEAVY PRECIPITATION
Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

HELE-SHAW MODEL
Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

HELICAL WAVES
Asymptotic Theory of Helical Waves on a Gaseous Jet in a Rotating Viscous Fluid,
W72-09237 2E

HEMING LAKE (MANITOBA)
Emergence of Caddisflies (Trichoptera) and Mayflies (Ephemeroptera) from Heming Lake, Manitoba,
W72-09570 5C

HEPTACHLOR
Appearance of 1-Hydroxychlordene in Soil, Crops, and Fish,
W72-09317 5A

HEPTACHLOR EPOXIDE
Appearance of 1-Hydroxychlordene in Soil, Crops, and Fish,
W72-09317 5A

HERBICIDES
Photochemistry of Bioactive Compounds. Solution-Phase Photochemistry of Asymmetric Triazin-5 (4H)-Ones,
W72-09250 5B

HERBIVORES
Energetics of Natural Populations of Freshwater Macroconsumers,
W72-09666 5C

HERMATYPIC
Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

HERRINGS
Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

HETEROTROPHIC BACTERIA
Distribution of Certain Heterotrophic Aerobic Bacteria in Eastern Mediterranean Deep-Sea Sediments, (Distribution De Certaines Bacteries Heterotrophes Aerobied Dans Les Sediments Profonds De Mediterranee Orientale),
W72-09349 5C

The Seasonal Selection by Temperature of Heterotrophic Bacteria in an Intertidal Sediment,
W72-09350 5C

Nitrogen Fixation by Bacteria in Lake Mize, Florida, and in Some Lacustrine Sediments,
W72-09579 5C

HETEROTROPHIC SUBSTRATES
Growth of Obligate Autotrophic Bacteria on Glucose in a Continuous Flow-Through Apparatus,
W72-09318 5C

HIGH PRESSURE
Desalination by High Pressure Solidification of Water to Ice VI,
W72-09516 3A

HISTORIC FLOODS
The Virginia Flood of 1969,
W72-09760 2E

HISTORY
The Fountains of Rome,
W72-09380 8A

HOKKAIDO (JAPAN)
Flow Measurements of Ice-Covered Rivers in Hokkaido,
W72-09628 2C

HOLLOW FIBERS
Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

HUDSON RIVER
Hudson River Channel, New York--Operation and Maintenance Action (Draft Environmental Impact Statement).
W72-09483 4A

HUDSON RIVER CHANNEL (N.Y.)
Hudson River Channel, New York--Operation and Maintenance Action (Draft Environmental Impact Statement).
W72-09483 4A

HUFFMAN CODE
Optimal Search for Pollution Sources,
W72-09232 5B

HUMIC ACIDS
Prediction of the Florida Red Tide by Means of the Iron Index; Red Tide, Iron and Humic Acid Levels in Streams.
W72-09524 5B

HUMIDITY
Responses of Stomata to Changes in Humidity,
W72-09783 2D

HUMMOCKS
Moisture Content of Hummocky Sands Under Pine Plantings in the Middle Don Region (Vlazhnost'bugristykh peskov pod sosnovymi nasazhdeniyami na srednem Donu),
W72-09749 2G

HURA CREPITANS D
Studies on a Piscicidal Constituent of Hura crepitans: I. Isolation and Characterization of Huratoxin and its Piscicidal Activity,
W72-09779 5C

HURATOXIN
Studies on a Piscicidal Constituent of Hura crepitans: I. Isolation and Characterization of Huratoxin and its Piscicidal Activity,
W72-09779 5C

HYDRAULIC CONDUCTIVITY
Influence of Soil Water Matric Potential and Hydraulic Conductivity on the Germination of Rape (Brassica napus L.),
W72-09780 3F

HYDRAULIC GATES
Theoretical Analysis of Flow Past Leaf Gate,
W72-09274 8B

HYDRAULIC LOADING
Organic Concentration and Hydraulic Loading Versus Organic Loading in Evaluation of Trickling Filter Performance,
W72-09596 5D

HYDRAULIC MODELS
Selective Withdrawal Studies for the Fish Hatchery Outlets at Pueblo Dam--Mathematical and Physical Models,
W72-09194 8B

The Potential of Physical Models to Investigate Estuarine Water Quality Problems,
W72-09548 5B

Selection of Scale for Riprap Model of In-Shore Harbor, Site X. Analytical Investigation,
W72-09615 8B

The Iowa Low Temperature Flow Facility,
W72-09627 2C

Flushing Studies, Victorial Channel, Victoria, Texas: Hydraulic Model Investigation,
W72-09761 8B

Status Report on the Gastineau Channel Model Study,
W72-09762 8B

HYDRAULIC SIMILITUDE
Selection of Scale for Riprap Model of In-Shore Harbor, Site X. Analytical Investigation,
W72-09615 8B

HYDRAULIC STRUCTURES
Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 9-11.
W72-09433 8A

HYDRAULIC TURBINES
Optimizing Hydraulic Turbine and Pump/Turbine Design,
W72-09710 8C

HYDRAULICS
Problems in the Utilization of Water Resources (Problemy ispol'zovaniya vodnykh resursov).
W72-09644 8B

HYDROBIOLOGY
Preliminary Hydrobiological Research of Some Southeast Asian Inland Waters, (In Japanese),
W72-09394 2K

Problems in Water Toxicology (Voprosy vodnoy toksikologii).
W72-09646 5C

Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

Determination of the Toxicity of Contaminated Freshwater with Respect to Certain Hydrobionts (Opredeleniye toksichnosti zagryaznennykh presnykh vod v otnoshenii nekotorykh gidrobiontov),
W72-09649 5C

Problem of Pesticides in Water Toxicology (Problema pestitsidov v vodnoy toksikologii),
W72-09650 5C

Effects of Pesticides on the Life of a Water Body (K voprosu o vliyanii pestitsidov na zhizn' vodoyema),
W72-09651 5C

Effects of DDT and Hexachlorocyclohexane on Aquatic Animals (K voprosu o vliyanii DDT i geksakhlorana na vodnyye organizmy),
W72-09652 5C

HYDROBIONTS
Problems in Water Toxicology (Voprosy vodnoy toksikologii).
W72-09646 5C

Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

Determination of the Toxicity of Contaminated Freshwater with Respect to Certain Hydrobionts (Opredeleniye toksichnosti zagryaznennykh presnykh vod v otnoshenii nekotorykh gidrobiontov),
W72-09649 5C

Problem of Pesticides in Water Toxicology (Problema pestitsidov v vodnoy toksikologii),
W72-09650 5C

HYDROCARBON POLLUTION
Kerosene-Like Tainting in Australian Mullet,
W72-09678 5C

HYDROCARBON TOXICITY
Effects of Petroleum Fractions on the Early Development of a Sea Urchin,
W72-09677 5C

HYDROELECTRIC PLANTS
Investigations into Frazil, Bottom Ice and Surface Ice Formation in the Niagara River,
W72-09632 2C

Ice Conditions in the Thjorsa River System,
W72-09641 2C

HYDROELECTRIC POWERPLANTS
Experience in the Operation of the Bratsk Hydroelectric Plant,
W72-09703 8C

HYDROGEN ION CONCENTRATION
Mechanism of Hydrogen Ion Buffering in Natural Waters,
W72-09687 5F

Plant Indicators for pH and Water Level in Peatlands at Candle Lake, Saskatchewan,
W72-09730 2H

HYDROGEN PEROXIDE
Methods for Clean Condensation of Atmospheric Moisture for Its Use in a Closed Ecological System,
W72-09583 5D

HYDROGENATION
Selective Hydrogenation of Soybean Oil. VI. Copper-on-Silica Gel Catalysts,
W72-09346 5A

HYDROGEOLOGY
Rural Water Supply in the Basement Complex of Western State, Nigeria,
W72-09275 3B

Ground-Water Resources of Cache Valley, Utah and Idaho,
W72-09558 4B

Analysis of the Ground-Water System by Electrical-Analog Model, Avra Valley, Pima and Pinal Counties, Arizona,
W72-09765 7C

Ground-Water Hydraulics,
W72-09769 2F

HYDROLOGIC BUDGET
Water Budget Analysis of a New England Wetland,
W72-09265 3B

Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

HYDROLOGIC CYCLE
Annotated Bibliography of Publications on Watershed Management by the Southeastern Forest Experiment Station, 1928-1970,
W72-09603 3B

HYDROLOGIC DATA
On the Water of the Canadian Arctic Archipelago, an Atlas Presentation of 1961 and 1962 Data,
W72-09227 7C

Water Resources Investigations in Mississippi, 1969.
W72-09534 7C

Salinity, Runoff and Wind Measurements, Yaquina Estuary, Oregon,
W72-09554 5C

Water supplies and the Land--The Elkhorn River Basin of Nebraska,
W72-09557 7C

Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

HYDROLOGY
A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

Electrical Analog Model Study of Water in Guayama Area, Puerto Rico: Phase 1 -- Assembling Data for the Analog Model,
W72-09543 2F

Water supplies and the Land--The Elkhorn River Basin of Nebraska,
W72-09557 7C

HYDROLYSIS
Hydrolysis and Solvent Partition of Phosdrin and Related Organophosphates,
W72-09321 5B

Waste Water Treatment Process,
W72-09492 5D

HYDROMETRY
Information Bulletin on Hydrometeorological Instruments and Investigation Techniques (Informatsionnyye materialy po gidrometeorologicheskim priboram i metodam nablyudeniy).
W72-09278 7B

HYDROPSYCHE SPP
The Effect of Temperature on the Feeding Rate and Behavior of the Caddisfly Hydropsyche frisoni,
W72-09686 5C

HYDROSPHERE
Glaciers and Geological Evolution of the Earth (Oledeneniya i geologicheskoye razvitiye zemli),
W72-09279 2C

HYDROSTATIC PRESSURE
Water Movement in a Plant Cell on Application of Hydrostatic Pressure,
W72-09786 2I

HYDROTHERMAL STUDIES
Kinetics of OH Radical Reactions in Irradiated Ordinary and Supercooled Water,
W72-09428 5B

ICE
The Design, Construction, and Use of an Ice Crystal Counter for Ice Crystal Cloud Studies by Aircraft,
W72-09209 2B

Instrumentation for In-Situ Determination of Ice Particle Size Distribution,
W72-09513 3A

Desalination by High Pressure Solidification of Water to Ice VI,
W72-09516 3A

Ice and Its Action on Hydraulic Structures.
W72-09623 2C

River and Coastal Ice Problems in Iceland,
W72-09624 2C

River and Lake Ice Terminology,
W72-09625 2C

Ice Monitoring Equipment,
W72-09626 2C

The Iowa Low Temperature Flow Facility,
W72-09627 2C

Calculation of Frazil Ice Production,
W72-09629 2C

Investigations into Frazil, Bottom Ice and Surface Ice Formation in the Niagara River,
W72-09632 2C

Heat Exchanges and Frazil Formation,
W72-09633 2C

Ice Cover Formation and Associated Hydro-Dynamic Effects in the Lower Part of the River Rhine,
W72-09634 2C

ICE BREAKUP
The Iowa Low Temperature Flow Facility,
W72-09627 2C

Break-Up and Control of River Ice,
W72-09642 2C

ICE BREAKUP CONTROL
Break-Up and Control of River Ice,
W72-09642 2C

ICE COVER
Ice and Its Action on Hydraulic Structures.
W72-09623 2C

Flow Measurements of Ice-Covered Rivers in Hokkaido,
W72-09628 2C

Temperature Gradients in a Lake Ice Cover,
W72-09630 2C

Temperature and Flow Conditions During the Formation of River Ice,
W72-09631 2C

Formation of Primary Ice Layers,
W72-09635 2C

Change of Velocity Distribution in a Cross-Section of a Freezing River and the Effect of Frazil Ice Loading on Velocity Distribution,
W72-09636 2C

A Study on the Formation of the River Ice in a Snow Area,
W72-09637 2C

Measurements of Ice Roughness and the Effect of Ice Cover on Water Levels in Three Norwegian Rivers,
W72-09638 2C

The Morphlogy and Physical Properties of Pressure Ridges: Barrow, Alaska, April 1969,
W72-09639 2C

The Structure of an Ice Ridge in the Baltic,
W72-09640 2C

ICE CRYSTAL COUNTER (CLOUDS)
The Design, Construction, and Use of an Ice Crystal Counter for Ice Crystal Cloud Studies by Aircraft,
W72-09209 2B

ICE JAMS
Ice and Its Action on Hydraulic Structures.
W72-09623 2C

River and Coastal Ice Problems in Iceland,
W72-09624 2C

Measurements of Ice Roughness and the Effect of Ice Cover on Water Levels in Three Norwegian Rivers,
W72-09638 2C

Ice Conditions in the Thjorsa River System,
W72-09641 2C

Break-Up and Control of River Ice,
W72-09642 2C

ICE LOADS
Ice and Its Action on Hydraulic Structures.
W72-09623 2C

Temperature Gradients in a Lake Ice Cover,
W72-09630 2C

ICE TERMINOLOGY
River and Lake Ice Terminology,
W72-09625 2C

ICE VI
Desalination by High Pressure Solidification of Water to Ice VI,
W72-09516 3A

ICED LAKES
Temperature Gradients in a Lake Ice Cover,
W72-09630 2C

ICELAND
River and Coastal Ice Problems in Iceland,
W72-09624 2C

Ice Monitoring Equipment,
W72-09626 2C

Calculation of Frazil Ice Production,
W72-09629 2C

Ice Conditions in the Thjorsa River System,
W72-09641 2C

IDAHO
Ground-Water Resources of Cache Valley, Utah and Idaho,
W72-09558 4B

ILLINOIS
Variations of Sulfur Isotope Ratios in Samples of Water and Air near Chicago,
W72-09336 5B

Farmers Levee and Drainage District (Draft Environmental Impact Statement).
W72-09477 4A

IMBALANCE OF COMMUNITIES
Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

INCINERATION
Effect of Porous Structure on Carbon Activation.
W72-09581 5D

INCUBATION
The Seasonal Selection by Temperature of Heterotrophic Bacteria in an Intertidal Sediment,
W72-09350 5C

INDIA
Water Pollution in Delhi Lakes,
W72-09175 5C

INDICATORS
Plant Indicators for pH and Water Level in Peatlands at Candle Lake, Saskatchewan,
W72-09730 2H

INDUSTRIAL WASTES
Membrane Processing of Cottage Cheese Whey for Pollution Abatement.
W72-09385 5D

Liquid Wastes from Canning and Freezing Fruits and Vegetables.
W72-09390 5D

The Effects of Cobalt-60 Radiation on Textile Processing Waste,
W72-09391 5D

Cost of Waste Treatment in the Meat Packing Industry,
W72-09397 5D

The Effect of Chloroform in Sewage on the Production of Gas From Laboratory Digesters,
W72-09398 5D

Pollution: Cleaning up Costs Money,
W72-09461 5G

Cook Industries V. Carlson (Right of Summary Abatement of Private Nuisance).
W72-09471 6E

INDUSTRIAL WASTES

Waste Water Treatment Process,
W72-09492 5D

Flotation of Solids from Waste Waters,
W72-09496 5D

Biochemical Process,
W72-09502 5D

Magnetic Flocculation of Steel Mill Waste Waters,
W72-09585 5D

Operation of a Central Waste Treatment System-Bayport Industrial Complex,
W72-09586 5D

The Clarification of Paper Mill Effluents by Activated Carbon Produced from Waste Sulfite Liquor and Other Refuse,
W72-09589 5D

Plating and Industrial Waste Treatment at the Expanded Plant of Fisher Body, Elyria, Ohio,
W72-09594 5D

Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

The Treatment of Industrial Wastewater for Reuse--Chrysler Indianapolis Foundry,
W72-09600 5D

Water Quality Control in Oregon.
W72-09669 5G

INFILTRATION

Two- and Three-Dimensional Infiltration: Seepage From Irrigation Channels and Infiltrometer Rings,
W72-09270 4A

INFORMATION REQUIREMENTS

Economic Information for Environmental Quality Management,
W72-09147 6G

INFORMATION RETRIEVAL

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendix 17. A Bibliography.
W72-09436 8A

INFRARED RADIATION

The Analysis of Nitrogen Containing Polymeric Ashless Oil Dispersants by Dialysis and Alumina Chromatography,
W72-09376 5A

INFRARED SPECTRA

Thin Layer Chromatography and Infra-Red and Ultra-Violet Spectra of Fenthion and Seven of its Degradation Products,
W72-09182 5A

INGESTION

Energetics of Natural Populations of Freshwater Macroconsumers,
W72-09666 5C

INHIBITION

Light-Induced Inhibition of Respiration in DCMU-Poisoned Chlorella by Photosystem I Activity,
W72-09178 5C

INLAND WATERWAYS

Preliminary Hydrobiological Research of Some Southeast Asian Inland Waters, (In Japanese),
W72-09394 2K

INSECT CONTROL

Gypsy Moth Suppression Project (Final Environmental Impact Statement).
W72-09466 5G

INSECTICIDES

Possible DDT Mortality in Young Rainbow Trout,
W72-09141 5C

Effects of Organochlorine Insecticides on Bacterial Growth, Respiration and Viability,
W72-09361 5C

Gypsy Moth Suppression Project (Final Environmental Impact Statement).
W72-09466 5G

INSTITUTIONAL CONSTRAINTS

Wastewater Treatment and Eutrophication,
W72-09170 5C

INSTITUTIONS

Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

INSTRUMENT

A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

INSTRUMENTATION

An Optical Lightning Detector,
W72-09208 2B

The Design, Construction, and Use of an Ice Crystal Counter for Ice Crystal Cloud Studies by Aircraft,
W72-09209 2B

Large Vertical Wind Tunnel for Hydrometeor Studies,
W72-09210 2B

Design, Construction and Testing of the Dropsonde,
W72-09211 2B

Information Bulletin on Hydrometeorological Instruments and Investigation Techniques (Informatsionnyye materialy po gidrometeorologicheskim priboram i metodam nablyudeniy).
W72-09278 7B

A Three-Dimensional Current Meter for Estuarine Applications,
W72-09334 2L

Hadamard-Transform Spectrometry: A New Analytical Technique,
W72-09418 2K

Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

Instrumentation for In-Situ Determination of Ice Particle Size Distribution,
W72-09513 3A

Ice Monitoring Equipment,
W72-09626 2C

Understanding Turbidity Measurement,
W72-09671 5F

Beach Water Table and Beach-Profile Measuring Equipment,
W72-09758 7B

INTER-AGENCY COOPERATION

Water Resources Investigations in Louisiana, 1968.
W72-09225 7C

Coordination Directory for Planning Studies and Reports, August 1971.
W72-09273 6E

Water Resources Investigations in Mississippi, 1969.
W72-09534 7C

Water Resources Investigations in Montana, 1969.
W72-09535 7C

Water Resources Investigations in Kansas, 1968.
W72-09536 7C

Water Resources Investigations in Missouri, 1968.
W72-09766 7C

Water Resources Investigations in New Jersey, 1968.
W72-09767 7C

Water Resources Investigations in Minnesota, 1969.
W72-09768 7C

INTERAGENCY COOPERATION

Water Resources Investigations in Iowa, 1968.
W72-09226 7C

INTERGLACIAL

Geologic Age of Ancient Lake Sediments of the Mologo-Sheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

INTERNATIONAL LAW

International and National Approaches to Oil Pollution Responsibility: An Emerging Regime for a Global Problem,
W72-09467 5G

U.S. Opposes Unilateral Extension by Canada of High Seas Jurisdiction.
W72-09472 6E

U.N. Adopts Principles Governing Seabed Exploitation and Decides to Convene Comprehensive Law-of-the-Sea Conference in 1973.
W72-09484 6E

President Nixon asks Senate Approval of Conventions on Pollution of the Sea by Oil,
W72-09485 6E

INTERNATIONAL WATERS

International and National Approaches to Oil Pollution Responsibility: An Emerging Regime for a Global Problem,
W72-09467 5G

INTERSTATE ARRANGEMENTS

Public Regulation of Water Quality in the United States,
W72-09527 5G

INTERTIDAL AREAS

The Seasonal Selection by Temperature of Heterotrophic Bacteria in an Intertidal Sediment,
W72-09350 5C

INTERVIEWS
Eyewitness Tornado Observations Obtained with Telephone and Tape Recorder,
W72-09217 2B

INVENTIONS
Information Bulletin on Hydrometeorological Instruments and Investigation Techniques (Informatsionnyye materialy po gidrometeorologicheskim priboram i metodam nablyudeniy).
W72-09278 7B

INVERTEBRATES
Invertebrates Collected on and around Carroll Island, Maryland,
W72-09173 5C

INVESTIGATIONS
Water Resources Investigations in Louisiana, 1968.
W72-09225 7C

Water Resources Investigations in Iowa, 1968.
W72-09226 7C

Coordination Directory for Planning Studies and Reports, August 1971.
W72-09273 6E

Water Resources Investigations in Missouri, 1968.
W72-09766 7C

Water Resources Investigations in New Jersey, 1968.
W72-09767 7C

Water Resources Investigations in Minnesota, 1969.
W72-09768 7C

IODIDES
The Toluene Extraction of Some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part 1. Extraction Behaviour of As, Au, Bi, Br, Cd, Cu, Ga, Ge, In, Hg, Mo, Pb, Sb, Se, Sn, W and Zn,
W72-09367 5A

IODINE
Electro-Oxidation of Iodine on Smooth Platinum in Aqueous Media,
W72-09245 5A

Iodine Colorimeter.
W72-09322 5A

Biogeochemical Sources of Iodine and Cobalt in Moldavia (Biogeokhimicheskiye provintsii yoda i kobalta v Moldavii),
W72-09643 2K

IODINE 131
Role of Solvent Extraction Parameters in Liquid Membrane Ion Selective Electrodes,
W72-09325 2K

ION ASSOCIATION
Ion Association and the Analysis of Precise Conductimetric Data,
W72-09544 2K

ION EXCHANGE
A Comparison of Some Ready-For-Use Thin Layers for the Separation of Heavy Metals with Butanol-3 N HCl,
W72-09353 5A

Wastewater Ammonia Removal by Ion Exchange.
W72-09383 5D

Wastewater Demineralization by Ion Exchange,
W72-09384 5D

Rapid and Simple Determination of 59Fe, 60Co, 65Zn, 137Cs, and 95Zr in Concentrated Salts Solutions,
W72-09440 5A

Self-Diffusion of Trace Concentrations of Ce-144, Pm-147, and Eu-155 in Water Solutions,
W72-09530 5B

ION SELECTIVE ELECTRODES
Performance and Application of a New Reference Electrode for Process Potentiometric Measurements,
W72-09242 5A

Coated Wire Ion Selective Electrodes,
W72-09324 2K

Role of Solvent Extraction Parameters in Liquid Membrane Ion Selective Electrodes,
W72-09325 2K

Organic Radical-Ion Salts as Selective Electrochemical Sensors,
W72-09366 5A

IONIZATION
Ion Association and the Analysis of Precise Conductimetric Data,
W72-09544 2K

IONS
The Spectrofluorimetric Determination of Sulphide,
W72-09253 5A

Coated Wire Ion Selective Electrodes,
W72-09324 2K

Role of Solvent Extraction Parameters in Liquid Membrane Ion Selective Electrodes,
W72-09325 2K

A Critical study of Some Parameters in Quantitative in situ Investigations of Thin-Layer Chromatography by Light Absorption Methods,
W72-09411 5A

Selectivity of Cyclic Polyether Type Liquid Membrane Electrodes,
W72-09415 5A

IOWA
Water Resources Investigations in Iowa, 1968.
W72-09226 7C

Appearance of 1-Hydroxychlordene in Soil, Crops, and Fish,
W72-09317 5A

The Iowa Low Temperature Flow Facility,
W72-09627 2C

Temperature and Flow Conditions During the Formation of River Ice,
W72-09631 2C

IRAN
Investigation and Measurement of Radium in Ramsar Mineral Water,
W72-09266 5B

IRON
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

Determination of Copper, Iron, and Zinc From a Single Small Sample,
W72-09243 5A

Sunlight Photochemistry of Ferric Nitrilotriacetate Complexes,
W72-09379 5A

Prediction of the Florida Red Tide by Means of the Iron Index; Red Tide, Iron and Humic Acid Levels in Streams.
W72-09524 5B

Magnetic Flocculation of Steel Mill Waste Waters,
W72-09585 5D

IRON COMPOUNDS
The Treatment of Industrial Wastewater for Reuse--Chrysler Indianapolis Foundry,
W72-09600 5D

IRON INDEX
Prediction of the Florida Red Tide by Means of the Iron Index; Red Tide, Iron and Humic Acid Levels in Streams.
W72-09524 5B

IRON OXIDE
The Operation of Pressure Type Sand Filters for Hot Mill Waste Waters,
W72-09587 5D

IRRADIATION
The Effects of Cobalt-60 Radiation on Textile Processing Waste,
W72-09391 5D

IRRIGABLE LAND
Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

Land Classification for Irrigation, Roosevelt County,
W72-09663 3F

Land Classification for Irrigation, Torrance County,
W72-09664 3F

Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

IRRIGATED LAND
Agricultural Water Demands,
W72-09526 6D

Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

IRRIGATION
The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

Manson Unit, Chelan Division, Chief Joseph Dam Project, Washington (Final Environmental Impact Statement).
W72-09473 8C

Agricultural Water Demands,
W72-09526 6D

Characteristics of Streamflow at Gaging Stations in Shell Creek, Elkhorn River, and Salt Creek Basins, Nebraska,
W72-09556 2E

IRRIGATION EFFECTS
Effects of Irrigation on Salt Regime of Dark-Chestnut Terrace Soils in the Transvolga Region (Vliyaniye orosheniya na solevoy rezhim terrasovykh temno-kashtanovykh pochv Zavolzh'ya),
W72-09751 3F

IRRIGATION EFFICIENCY
Estimating Soil Moisture Depletion from Climate, Crop and Soil Data,
W72-09223 2G

IRRIGATION POTENTIAL
Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

Land Classification for Irrigation, Roosevelt County,
W72-09663 3F

Land Classification for Irrigation, Torrance County,
W72-09664 3F

Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

IRRIGATION PRACTICES
Optimal Distribution of Water to Irrigation Canals,
W72-09195 3F

IRRIGATION PROGRAMS
Estimating Soil Moisture Depletion from Climate, Crop and Soil Data,
W72-09223 2G

IRRIGATION WELLS
Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

Use of Groundwater for Irrigation in Clay County, Nebraska, 1970,
W72-09756 4B

ISOHYETS
Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

ISOLATION
Factors Involved in the Isolation of Clostridium Perfringens,
W72-09370 5A

ISOMERS
Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

ISOPLETH MAPPING
Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

ISOPODS
A New Species of Troglobitic Asellid From Illinois,
W72-09520 5C

ISRAEL
Sedimentary Structures Formed by Flash Floods in Southern Israel,
W72-09540 2J

JAMAICA
Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

JAMES RIVER BASIN (VA)
The Virginia Flood of 1969,
W72-09760 2E

JEWELL POND (N. H.)
Water Budget Analysis of a New England Wetland,
W72-09265 3B

JUDICIAL DECISIONS
Cook Industries V. Carlson (Right of Summary Abatement of Private Nuisance).
W72-09471 6E

JURISDICTION
Rights and Responsibilities of Arctic Coastal States: The Canadian View,
W72-09465 6E

U.S. Opposes Unilateral Extension by Canada of High Seas Jurisdiction.
W72-09472 6E

KANANASKIS RIVER
A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

KANSAS
Water Resources Investigations in Kansas, 1968.
W72-09536 7C

KARST
Groundwater Flow in Calcareous Aquifers in the Vicinity of Barcelona, Spain,
W72-09277 2F

KARST HYDROLOGY
Groundwater Flow in Calcareous Aquifers in the Vicinity of Barcelona, Spain,
W72-09277 2F

KENTUCKY
Stream Capture in Kentucky Indicated by Distributional Records of Fundulus catenatus and etheostoma spectabile,
W72-09252 4A

Willard, Kentucky. Partial Flood Protection Plan, Dry Fork of Little Fork of Little Sandy River (Final Environmental Impact Statement).
W72-09464 8D

KERN RIVER BASIN
Trouts of the Upper Kern River Basin, California, with Reference to Systematics and Evolution of Western North American Salmo,
W72-09515 2E

KEROSENE POLLUTION
Kerosene-Like Tainting in Australian Mullet,
W72-09678 5C

KEZAR LAKE
Algae Control by Mixing, Staff Report on Kezar Lake in Sutton, N.H.
W72-09304 5G

KILLIFISHES
Ecology and Life History of the Diamond Killifish: Adinia xenica (Jordan and Gilbert),
W72-09360 2L

KINETICS
Factors Affecting Nitrification Kinetics,
W72-09174 5D

Kinetics of OH Radical Reactions in Irradiated Ordinary and Supercooled Water,
W72-09428 5B

KINGSTON (ONTARIO)
Temperature Gradients in a Lake Ice Cover,
W72-09630 2C

KRAFT MILL WASTES
The Characteristics of Residues in Spent Chlorination Liquor,
W72-09592 5D

L-HYDROXYCHLORDENE
Appearance of 1-Hydroxychlordene in Soil, Crops, and Fish,
W72-09317 5A

LABORATORY EQUIPMENT
Performance and Application of a New Reference Electrode for Process Potentiometric Measurements,
W72-09242 5A

Design and Construction of a Saltwater Environment Simulator,
W72-09553 5C

LABORATORY TESTS
Algal Responses to Nutrient Additions in Natural Waters. I. Laboratory Assays,
W72-09164 5C

Two- and Three-Dimensional Infiltration: Seepage From Irrigation Channels and Infiltrometer Rings,
W72-09270 4A

Stabilization of Refinery Waste Water with the Activated Sludge Process: Determination of Design Parameters,
W72-09593 5D

Formation of Primary Ice Layers,
W72-09635 2C

LACTOSE
Membrane Processing of Cottage Cheese Whey for Pollution Abatement.
W72-09385 5D

LAKE BASINS
New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

LAKE CHELAN (WASH)
Manson Unit, Chelan Division, Chief Joseph Dam Project, Washington (Final Environmental Impact Statement).
W72-09473 8C

LAKE ERIE
Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

LAKE MICHIGAN
Phosphorus, Silica, and Eutrophication of Lake Michigan,
W72-09166 5C

Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

LAKE MIZE
Nitrogen Fixation by Bacteria in Lake Mize, Florida, and in Some Lacustrine Sediments,
W72-09579 5C

LAKE MONONA (WIS)
Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

LAKE MORPHOLOGY
Algae Control by Mixing, Staff Report on Kezar Lake in Sutton, N.H.
W72-09304 5G

LAKE ONTARIO
Temperature Gradients in a Lake Ice Cover,
W72-09630 2C

LAKE REGULATION RULES
Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

LAKE ROOSEVELT (WASH)
Mathematical Models for the Prediction of Thermal Energy Changes in Impoundments.
W72-09727 5B

LAKE SEDIMENTS
Penetration of Bog Peats and Lake Sediments by Tritium From Atmospheric Fallout,
W72-09240 5B

New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

Geologic Age of Ancient Lake Sediments of the Mologo-Sheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

LAKE SUPERIOR
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

LAKE TAHOE (CALIF)
Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

LAKE TROUT
Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

LAKE WASHINGTON (WASH)
Nutrients and Phytoplankton in Lake Washington,
W72-09167 5C

LAKES
Biogeochemistry of Lakes: Major Substances,
W72-09157 5C

The Role of Carbon in Hard-Water Marl Lakes,
W72-09161 5C

Water Pollution in Delhi Lakes,
W72-09175 5C

Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

LAND CLASSIFICATION
Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

Land Classification for Irrigation, Roosevelt County,
W72-09663 3F

Land Classification for Irrigation, Torrance County,
W72-09664 3F

Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

LAND DEVELOPMENT
Farmers Levee and Drainage District (Draft Environmental Impact Statement).
W72-09477 4A

LAND MANAGEMENT
Hitson, C and L and Washburn Draws, Watershed, Texas (Draft Environmental Impact Statements).
W72-09476 4B

LAND RECLAMATION
Groundwater and Drainage-Water Mineralization in the Mugan-sal'yany Region (Mineralizatsiya gruntovykh i drenazhnykh vod Mugano-Sal'yanskogo massiva),
W72-09750 4B

Effects of Irrigation on Salt Regime of Dark-Chestnut Terrace Soils in the Transvolga Region (Vliyaniye orosheniya na solevoy rezhim terrasovykh temno-kashtanovykh pochv Zavolzh'ya),
W72-09751 3F

LAND RESOURCES
Water and Land Resources, Ouachita River Basin in Arkansas,
W72-09309 6D

LAND USE
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

LARVAL GROWTH STAGE
Some Quantitative Feeding Patterns Exhibited by the Copepod Calanus,
W72-09248 5C

LARVICIDES
The Temporary Abatement of Nuisance Species of Trichoptera with DDD (TDE) Larvicide,
W72-09412 5C

Laboratory Release Rate Studies of Dursban-Polymeric Formulations, March-July 1970,
W72-09676 5B

Polymer Formulations of Dursban and Abate as Mosquito Larvicides, April - October, 1970,
W72-09720 5B

Effects of Polymer Formulations of Dursban and Abate on Non-Target Organism Populations, April - October, 1970,
W72-09721 5C

LAW ENFORCEMENT
A Statutory Analysis of Florida's Water Pollution Control Legislation,
W72-09479 6E

LAW OF THE SEA
Rights and Responsibilities of Arctic Coastal States: The Canadian View,
W72-09465 6E

U.S. Opposes Unilateral Extension by Canada of High Seas Jurisdiction.
W72-09472 6E

U.N. Adopts Principles Governing Seabed Exploitation and Decides to Convene Comprehensive Lawtof-the-Sea Conference in 1973.
W72-09484 6E

President Nixon asks Senate Approval of Conventions on Pollution of the Sea by Oil,
W72-09485 6E

LEACHING
Migration and Leaching of Metals from Old Mine Tailings Deposits,
W72-09620 5B

LEAD
The Determination of Lead and Cadmium in Soils and Leaves by Atomic Absorption Spectroscopy,
W72-09331 5A

A Modified Delves Cup Atomic Absorption Procedure for the Determination of Lead in Blood,
W72-09332 5A

Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

LEAD CONTENT
A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

LEAF GATES
Theoretical Analysis of Flow Past Leaf Gate,
W72-09274 8B

LEAVES
The Determination of Lead and Cadmium in Soils and Leaves by Atomic Absorption Spectroscopy,
W72-09331 5A

Changed Resistance of Aspen Mesophyll as a Response to Rapid Leaf Drying, (In Russian),
W72-09775 2D

Daily Dynamics of Transpiration of Upper and Lower Sides of Leaves in Some Monocotyledonous and Dicotyledonous Plants, (In Ukrainian),
W72-09785 2D

LEBANON
Contribution of the Study of Zooplankton in Lebanese Waters, (Contribution A L' Etude Du Zooplancton Des Eaux Libanaises),
W72-09355 5A

LEGAL ASPECTS
Public Regulation of Water Quality in the United States,
W72-09527 5G

LEGISLATION
President's Message--Environmental Protection,
W72-09460 6E

LEVEES
Farmers Levee and Drainage District (Draft Environmental Impact Statement).
W72-09477 4A

Dyersburg, Tennessee (Draft Environmental Impact Statement).
W72-09480 8D

Levee Unit No. L-246, Missouri River Levee System (Draft Environmental Impact Statement).
W72-09481 8D

LIBRARIES
Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendix 17. A Bibliography.
W72-09436 8A

LIFE HISTORY STUDIES
Ecology and Life History of the Diamond Killifish: Adinia xenica (Jordan and Gilbert),
W72-09360 2L

LIFE SPAN
Relationship between the Productivity of Marine Mollusks and Their Life-Span,
W72-09569 5C

LIGHT PENETRATION
The Relation of Snow Transparency to Density and Air Permeability in a Natural Snow Cover,
W72-09607 2C

LIGHTNING
An Optical Lightning Detector,
W72-09208 2B

Charging of Droplets by Impulse Corona,
W72-09212 2B

Field-Enhanced Propagation of Positive Streamers and Implications to Electrically Influenced Droplet Coalescence,
W72-09213 2B

Effect of Electric Field on Charge Separation by the Falling Precipitation Mechanism in Thunderclouds,
W72-09215 2B

Miniature Whirlwinds Produced in the Laboratory by High-Voltage Electrical Discharges,
W72-09216 2B

Mountain-Peak Potential-Gradient Measurements and the Andes Glow,
W72-09219 2B

LIGHTNING DETECTOR
An Optical Lightning Detector,
W72-09208 2B

LIGNINS
Electrically Induced Coagulation of Lignin from Kraft Mill Wastewaters,
W72-09597 5D

LIME
Magnesium Carbonate, A Recycled Coagulant for Water Treatment.
W72-09387 5F

LIMITING FACTORS
The Role of Minor Nutrients in Limiting the Productivity of Aquatic Ecosystems,
W72-09158 5C

Carbon Limitation in Sewage Lagoons,
W72-09162 5C

Characterization of Phosphorus-Limited Plankton Algae,
W72-09163 5C

LIMITING NUTRIENTS
Nutrients and Eutrophication: The Limiting Nutrient Controversy.
W72-09155 5C

Biogeochemistry of Lakes: Major Substances,
W72-09157 5C

The Role of Minor Nutrients in Limiting the Productivity of Aquatic Ecosystems,
W72-09158 5C

The Interrelation of Carbon and Phosphorus in Regulating Heterotrophic and Autotrophic Populations in an Aquatic Ecosystem, Shriner's Pond,
W72-09159 5C

Phytoplankton Photosynthesis, Micronutrient Interactions, and Inorganic Carbon Availability in a Soft-Water Vermont Lake,
W72-09160 5C

The Role of Carbon in Hard-Water Marl Lakes,
W72-09161 5C

Carbon Limitation in Sewage Lagoons,
W72-09162 5C

Characterization of Phosphorus-Limited Plankton Algae,
W72-09163 5C

Algal Responses to Nutrient Additions in Natural Waters. I. Laboratory Assays,
W72-09164 5C

Algal Responses to Nutrient Additions in Natural Waters. II. Field Experiments,
W72-09165 5C

Phosphorus, Silica, and Eutrophication of Lake Michigan,
W72-09166 5C

Nutrients and Phytoplankton in Lake Washington,
W72-09167 5C

Natural Carbon Sources, Rates of Replenishment, and Algal Growth,
W72-09168 5C

LINEAR PROGRAMMING
Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

LIPIDS
Biochemical Process,
W72-09502 5D

LIQUEFACTION
Resistance of Soil to Liquefaction and Settlement,
W72-09704 8D

LIQUID MEMBRANE ELECTRODES
Coated Wire Ion Selective Electrodes,
W72-09324 2K

Role of Solvent Extraction Parameters in Liquid Membrane Ion Selective Electrodes,
W72-09325 2K

Selectivity of Cyclic Polyether Type Liquid Membrane Electrodes,
W72-09415 5A

LIQUID OXYGEN
Apparatus for Reoxygenating a Body of Water,
W72-09503 5G

LIQUID WASTES
Removal of Inorganic Species by Liquid Membrane,
W72-09497 5D

Separator for Nonmiscible Liquids,
W72-09509 5G

LITHOSPHERE
Glaciers and Geological Evolution of the Earth (Oledeneniya i geologicheskoye razvitiye zemli),
W72-09279 2C

LOAM
Response of Rice to Phosphate Manuring in a Waterlogged Lateritic Sandy Loam of Kerala,
W72-09578 3F

LOCAL GOVERNMENTS
How Seattle Beat Pollution,
W72-09179 5C

LOCAL PRECIPITATION
Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

LOCKS
Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 9-11.
W72-09433 8A

LOUISIANA
Water Resources Investigations in Louisiana, 1968.
W72-09225 7C

LUSK CREEK
A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

MACROINVERTEBRATES
Relationship between the Productivity of Marine Mollusks and Their Life-Span,
W72-09569 5C

MAGNESIUM CARBONATE
Magnesium Carbonate, A Recycled Coagulant for Water Treatment.
W72-09387 5F

MAGNETIC FLOCCULATION
Magnetic Flocculation of Steel Mill Waste Waters,
W72-09585 5D

MAINE
Notes on the Biology of Pygospio Elegans from Maine,
W72-09685 5C

MAINTENANCE
The Formation and Maintenance of Water-Meadows in Hampshire, England,
W72-09707 4A

MAIZE-M
On The Minimal Soil Tillage In Growing Maize Under Irrigation, (In Bulgarian),
W72-09753 3F

Daily Dynamics of Transpiration of Upper and Lower Sides of Leaves in Some Monocotyledonous and Dicotyledonous Plants, (In Ukrainian),
W72-09785 2D

MALATHION
Effects of Malathion on Two Warm-Water Fishes and Aquatic Invertebrates in Ponds,
W72-09567 5C

MAMMALS
Patterns of Use of a Flood Plain by Zambian Mammals,
W72-09724 2I

MANGROVE SWAMPS
The Mangrove Swamp and Salt Marsh Communities of the Sydney District. IV. The Significance of Species Interaction,
W72-09286 2L

MAPS
Water Resources Investigations in Mississippi, 1969.
W72-09534 7C

Water Resources Investigations in Montana, 1969.
W72-09535 7C

Water Resources Investigations in Kansas, 1968.
W72-09536 7C

MARINE ALGAE
Possible Effects of Organochlorine Pesticides on Primary Productivity and Skeletogenesis of New England Estuarine and Coastal Marine Algae,
W72-09653 5C

MARINE ANIMALS
Automatic Monitoring Method Using Biological Concentration for Marine Radioactive Contamination,
W72-09454 5A

Monitoring Metals in Marine Animals,
W72-09718 5A

MARINE BACTERIA
Taxonomy of Marine Bacteria: Beneckea nigrapulchrituda Sp. N.,
W72-09241 5A

Distribution of Certain Heterotrophic Aerobic Bacteria in Eastern Mediterranean Deep-Sea Sediments, (Distribution De Certaines Bacteries Heterotrophes Aerobied Dans Les Sediments Profonds De Mediterranee Orientale),
W72-09349 5C

Bacterial Populations as Components of Oceanic Ecosystems,
W72-09351 5B

Mechanism of the Initial Events in the Sorption of Marine Bacteria to Surfaces,
W72-09568 5C

MARINE BIOLOGY
Automatic Monitoring Method Using Biological Concentration for Marine Radioactive Contamination,
W72-09454 5A

MARINE GEOLOGY
History of the World's Oceans (Istoriya Mirovogo okeana).
W72-09282 2L

MARINE WATER
Rapid and Simple Determination of 59Fe, 60Co, 65Zn, 137Cs, and 95Zr in Concentrated Salts Solutions,
W72-09440 5A

MARION LAKE (B.C.)
Ecology of the Epipelic Algal Communities in Marion Lake, British Columbia,
W72-09681 5C

MARL
The Role of Carbon in Hard-Water Marl Lakes,
W72-09161 5C

MARL LAKES
The Role of Carbon in Hard-Water Marl Lakes,
W72-09161 5C

MARTHA'S VINEYARD (MASS.)
Lagoon Pond Navigation Project, Martha's Vineyard, Massachusetts (Final Environmental Impact Statement).
W72-09463 4A

MARYLAND
Invertebrates Collected on and around Carroll Island, Maryland,
W72-09173 5C

MASS BALANCES
Activated Sludge Processing.
W72-09389 5D

MASS SPECTROMETRY
Simple Device for Introduction of Mass Calibrant into a Gas Chromatograph-Mass Spectrometer System,
W72-09323 2K

GC/MS/Computers,
W72-09327 2K

Diurnal Uptake of NO3 and NH4 by a Ceratophyllum-Periphyton Community,
W72-09406 5C

MASS TRANSFER
A Comparison of Mass-Transfer and Climatic-Index Evaporation Computations from Small Reservoirs in Texas,
W72-09555 2H

MASSACHUSETTS
Lagoon Pond Navigation Project, Martha's Vineyard, Massachusetts (Final Environmental Impact Statement).
W72-09463 4A

Attorney General V. Baldwin (Noncompliance with Terms of Permit to Fill).
W72-09470 6E

MASTER SEWERAGE PLAN
A Master Sewerage Plan for Burlington County, New Jersey.
W72-09303 6D

MATERIALS BALANCE
Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

MATERIALS DISPOSAL
The Economist's Approach to Pollution and Its Control,
W72-09145 6C

MATHEMATICAL MODELS
Externalities and Public Goods,
W72-09143 6A

Selective Withdrawal Studies for the Fish Hatchery Outlets at Pueblo Dam--Mathematical and Physical Models,
W72-09194 8B

Optimal Search for Pollution Sources,
W72-09232 5B

Computer Software for Wastewater Treatment Plant Design,
W72-09233 5D

Asymptotic Theory of Helical Waves on a Gaseous Jet in a Rotating Viscous Fluid,
W72-09237 2E

Stream Temperature Prediction Under Reduced Flow,
W72-09259 4A

Available Soil Water: Time-Distribution in a Warm Season Rangeland,
W72-09271 2A

Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

The Role of the Diffuse Layer in Water-In-Oil Microemulsions,
W72-09335 5A

The Relative Importance of Freshwater Input, Temperature and Tidal Range in Determining Levels of Dissolved Oxygen in a Polluted Estuary,
W72-09345 5B

Mathematical Model for Fate of Pollutants in Near-Shore Waters,
W72-09377 5B

Applications of Some Numerical Models to Pacific Northwest Estuaries,
W72-09549 5B

Infill of Nuclear Rubble Chimneys by Ground Water,
W72-09617 4B

Mathematical Models for the Prediction of Thermal Energy Changes in Impoundments.
W72-09727 5B

MATHEMATICAL STUDIES
Selective Withdrawal Studies for the Fish Hatchery Outlets at Pueblo Dam--Mathematical and Physical Models,
W72-09194 8B

MATRIC POTENTIAL
Effect of Osmotic and Matric Potentials on the Availability of Water for Seed Germination,
W72-09773 2I

Influence of Soil Water Matric Potential and Hydraulic Conductivity on the Germination of Rape (Brassica napus L.),
W72-09780 3F

MAYFLIES
Emergence of Caddisflies (Trichoptera) and Mayflies (Ephemeroptera) from Heming Lake, Manitoba,
W72-09570 5C

MEADOW-BOG SOILS
Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

MEADOW SOILS
Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

MEASUREMENT
Optimal Search for Pollution Sources,
W72-09232 5B

Information Bulletin on Hydrometeorological Instruments and Investigation Techniques (Informatsionnyye materialy po gidrometeorologicheskim priboram i metodam nablyudeniy).
W72-09278 7B

Measurement of Alpha Particle Radioactivity of Water.
W72-09421 5A

Standard Method of Test for Radionuclides of Radium in Water.
W72-09422 5A

Standard Method of Test for Radioactive Cesium in Water.
W72-09423 5A

Recreational Use of the Columbia River: Evaluation of Environmental Exposure,
W72-09426 6B

Rapid Methods for Measuring Raidoactivity in the Environment.
W72-09437 5A

Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

Rapid and Simple Determination of 59Fe, 60Co, 65Zn, 137Cs, and 95Zr in Concentrated Salts Solutions,
W72-09440 5A

Determination of Plutonium in Environmental Surveillance Samples,
W72-09441 5A

Rapid Identification and Determination of Alpha Emitters in Environmental Samples,
W72-09442 5A

Monitoring of Tritium Under Emergency Conditions,
W72-09443 5A

A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

Rapid Determination of Gamma-Ray Emitting Radionuclides in Water (Schnelle Bestimmung Gammastrahlender Radionuklide in Wassern),
W72-09445 5A

Rapid Evaluation of Radioactive Samples by Gamma-Ray Spectrometry,
W72-09446 5A

Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

Radioactive and Metallic (Copper and Zinc) Pollutants in the Scheldt Estuary (in Water, Sediment and Suspended Matter), (Les Polluants Radioactifs et Metalliques (Cuivre et Zinc) dans L'Estuaire De L'Escaut (Eaux, Sediments et Matieres en Suspension)),
W72-09455 5A

Rapid Methods for Radioactive Environmental Monitoring in the Federal Republic of Germany, (Schnellmethoden Zur Uberwachung Der Radioaktivitat in Der Bundesrepublik Deutschland),
W72-09456 5A

System for Measuring Organic Content of Water,
W72-09493 5D

Tropospheric Scavenging of 90Sr and 3H,
W72-09528 5A

Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

MEAT PACKING INDUSTRY
Cost of Waste Treatment in the Meat Packing Industry,
W72-09397 5D

MEDIA SIZE
Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

MELTING
Permafrost Erosion Along the Beaufort Sea Coast,
W72-09546 2J

MEMBRANES
Removal of Inorganic Species by Liquid Membrane,
W72-09497 5D

Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

MERCURY
Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

The Rate of Loss of Mercury by Pacific Oysters,
W72-09667 5A

MERCURY RADIOISOTOPES
The Rate of Loss of Mercury by Pacific Oysters,
W72-09667 5A

MESH REINFORCEMENT
Tensile Tests of Ferrocement,
W72-09709 8F

METABOLISM
Nutrient Flux in Estuaries,
W72-09172 5C

Introductory Lecture: Prospects and Problems in Continuous Flow Culture of Micro-Organisms,
W72-09341 5C

Pollutants and Food-Chains,
W72-09402 5C

Mechanism of the Growth Inhibitory Effect of Cysteine on Escherichia Coli,
W72-09407 5C

METABOLITES
Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

METAL-BEARING WASTES
Plating and Industrial Waste Treatment at the Expanded Plant of Fisher Body, Elyria, Ohio,
W72-09594 5D

METEOROLOGICAL DATA
The Design, Construction, and Use of an Ice Crystal Counter for Ice Crystal Cloud Studies by Aircraft,
W72-09209 2B

A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

Catalogue of Meteorological Data of the Snowy Mountains Region, Australia.
W72-09771 7C

METEOROLOGICAL EFFECTS
Meteorological Effects of Cooling Tower Plumes,
W72-09305 2B

METEOROLOGY
Mountain-Peak Potential-Gradient Measurements and the Andes Glow,
W72-09219 2B

Considerations Regarding Solar and Lunar Modulation of Geophysical Parameters, Atmospheric Electricity and Thunderstorms,
W72-09221 2B

Bomex Temporary Archive Description of Available Data,
W72-09263 7C

Information Bulletin on Hydrometeorological Instruments and Investigation Techniques (Informatsionnyye materialy po gidrometeorologicheskim priboram i metodam nablyudeniy).
W72-09278 7B

Topographic Effects Apparent in Nocturnal Temperature Profiles in a Conifer Canopy,
W72-09608 2D

Vertical Profiles of Windspeed in a Pine Stand,
W72-09609 2I

Atmospheric Precipitation in the Armenian SSR (Atmosfernyye osadki v Armyanskoy SSR),
W72-09746 2B

Long-Term Cyclic Fluctuations of Atmospheric Precipitation in the USSR (Mnogoletniye tsiklicheskiye kolebaniya atmosfernykh osadkov na territorii SSSR),
W72-09747 2B

METHANOL
Gas-Liquid Chromatographic Determination of Furfural in Aqueous Solution,
W72-09403 5A

METHODOLOGY
The Determination of Nitrilotriacetic Acid (NTA) In Sewage and Sewage Effluent,
W72-09251 5A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

METHYL PARATHION
Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

METHYLATION
Methylation of Pentachlorophenol by Trichoderma Virgatum,
W72-09562 5B

METHYLENE BLUE ACTIVE SUBSTANCE
Toxicity Assessment of Treated Municipal Wastewaters,
W72-09582 5D

MICELLES
Nuclear Magnetic Resonance Study of Interaction between Anionic and Nonionic Surfactants in their Mixed Micelles,
W72-09410 5A

MICHIGAN
Le Van V. Hedlund Plumbing and Heating (Adjacent Landowners Obligation to Accept Natural Drainage of Surface Waters).
W72-09469 6E

MICROBIAL GROWTH
Continuously Synchronised Growth,
W72-09340 5C

MICROEMULSIONS
The Role of the Diffuse Layer in Water-In-Oil Microemulsions,
W72-09335 5A

MICROMETEOROLOGY
Topographic Effects Apparent in Nocturnal Temperature Profiles in a Conifer Canopy,
W72-09608 2D

MICROORGANISMS
Continuously Synchronised Growth,
W72-09340 5C

Summer Conference of Society for Applied Bacteriology, Liverpool, 13-15 July 1971,
W72-09675 5C

Use of Acid-Treated Sodium Silicate in Coagulation,
W72-09691 5F

MICROSTRAINING
Filtration of Water and Wastewater,
W72-09393 5D

The Ozonization of Turret and Other Scottish Waters,
W72-09690 5F

MIDGES
Environmental Control of the Abundance and Distribution of the Chydorid Cladocera,
W72-09458 2H

MILK
Rapid Methods for Radioactive Environmental Monitoring in the Federal Republic of Germany, (Schnellmethoden Zur Uberwachung Der Radioaktivitat in Der Bundesrepublik Deutschland),
W72-09456 5A

MILLIPORE FILTERS
Measurement and Control of Particulate Matter in Filter Effluents,
W72-09693 5F

MINE WASTES
Migration and Leaching of Metals from Old Mine Tailings Deposits,
W72-09620 5B

MINERAL WATER
Investigation and Measurement of Radium in Ramsar Mineral Water,
W72-09266 5B

Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

MINERALIZATION
Groundwater and Drainage-Water Mineralization in the Mugan-sal'yany Region (Mineralizat-

MINERALIZATION

siya gruntovykh i drenazhnykh vod Mugano-Sal'yanskogo massiva),
W72-09750 4B

MINERALOGY
New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

Determination of Antimony in Geological Materials by Atomic Absorption Spectrometry,
W72-09328 5A

MINERALS
Elution of Mineral Components Out of Dead Reed Phragmites communis Trin,
W72-09778 2H

MINNESOTA
Water Resources Investigations in Minnesota, 1969.
W72-09768 7C

MISSISSIPPI
Water Resources Investigations in Mississippi, 1969.
W72-09534 7C

MISSOURI
Levee Unit No. L-246, Missouri River Levee System (Draft Environmental Impact Statement).
W72-09481 8D

Water Resources Investigations in Missouri, 1968.
W72-09766 7C

MISSOURI RIVER
Levee Unit No. L-246, Missouri River Levee System (Draft Environmental Impact Statement).
W72-09481 8D

MISSOURI RIVER BASIN
A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

MIXED GOODS
Externalities and Public Goods,
W72-09143 6A

MIXING
Self-Diffusion of Trace Concentrations of Ce-144, Pm-147, and Eu-155 in Water Solutions,
W72-09530 5B

Methods for Evaluating Effects of Transient Conditions in Heavily Loaded and Extensively Regulated Streams,
W72-09731 5B

Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

MODEL STUDIES
Systems Analysis for Water Quality Management - Survey and Abstracts.
W72-09229 5G

Hydro-Physiographic Model,
W72-09234 6A

Water Treatment Plant Staging Policy,
W72-09289 5F

Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

Hydrologic Investigation of Small Watersheds in Ohio, Phase I: 1966-1969,
W72-09296 2A

Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

The Approximate Theories of Pneumatic Wave Generators,
W72-09541 8B

Design and Construction of a Saltwater Environment Simulator,
W72-09553 5C

Ecological Dynamics of Watersheds,
W72-09565 2A

Drainage from Level and Sloping Land,
W72-09698 8B

A Method for Predicting the Performance of Natural Draft Cooling Towers.
W72-09726 5D

Mathematical Models for the Prediction of Thermal Energy Changes in Impoundments.
W72-09727 5B

Research on the Physical Aspects of Thermal Pollution.
W72-09728 5B

An Analytical and Experimental Investigation of Surface Discharges of Heated Water,
W72-09729 5B

Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

Model of Plant Productivity at Limited Water Supply Considering Adaptation,
W72-09782 2I

MOISTURE CONTENT
Seasonal and Diurnal Changes in Moisture Contents and Water Deficits of Engelmann Spruce Needles,
W72-09606 2I

Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

Moisture Variations in a Model Sod-Podzolic Soil (O nekotorykh zakonomernostyakh var-'irovaniya vlazhnosti v model'noy dernovo-podzolistoy pochve),
W72-09748 2G

Moisture Content of Hummocky Sands Under Pine Plantings in the Middle Don Region (Vlazhnost'bugristykh peskov pod sosnovymi nasazhdeniyami na srednem Donu),
W72-09749 2G

MOISTURE DEFICIT
Seasonal and Diurnal Changes in Moisture Contents and Water Deficits of Engelmann Spruce Needles,
W72-09606 2I

MOISTURE STRESS
Seasonal and Diurnal Changes in Moisture Contents and Water Deficits of Engelmann Spruce Needles,
W72-09606 2I

MOLDAVIA
Biogeochemical Sources of Iodine and Cobalt in Moldavia (Biogeokhimicheskiye provintsii yoda i kobalta v Moldavii),
W72-09643 2K

MOLLUSKS
Relationship between the Productivity of Marine Mollusks and Their Life-Span,
W72-09569 5C

Malacological Resources of the Gulf of San Matias with some Observations made in the Exploratory Campaign SAO-I-71,
W72-09708 2L

MONITORING
An Optical Lightning Detector,
W72-09208 2B

Water Pollution Monitoring Stations: An Ounce of Prevention,
W72-09374 5A

Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

Rapid Methods for Measuring Raidoactivity in the Environment.
W72-09437 5A

Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

Rapid and Simple Determination of 59Fe, 60Co, 65Zn, 137Cs, and 95Zr in Concentrated Salts Solutions,
W72-09440 5A

Determination of Plutonium in Environmental Surveillance Samples,
W72-09441 5A

Rapid Identification and Determination of Alpha Emitters in Environmental Samples,
W72-09442 5A

Monitoring of Tritium Under Emergency Conditions,
W72-09443 5A

A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

Rapid Evaluation of Radioactive Samples by Gamma-Ray Spectrometry,
W72-09446 5A

Role of Low-Background Beta-Ray Spectrometers for Rapid Assay of Environmental Samples,
W72-09447 5A

Determination of Environmental Radioactivity by Liquid-Scintillation Spectrometry,
W72-09448 5A

Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

Measurements of 89Sr and 90Sr in Environmental Samples by a Low-Background Beta-Ray Spectrometer,
W72-09450 5A

A Quick and Convenient Measurement Method for Surface and Liquid Contamination Using the TLD System,
W72-09451 5A

Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

Sampling and Analytical Systems for Measuring Environmental Radioactivity,
W72-09453 5A

Automatic Monitoring Method Using Biological Concentration for Marine Radioactive Contamination,
W72-09454 5A

Radioactive and Metallic (Copper and Zinc) Pollutants in the Scheldt Estuary (in Water, Sediment and Suspended Matter), (Les Polluants Radioactifs et Metalliques (Cuivre et Zinc) dans L'Estuaire De L'Escaut (Eaux, Sediments et Matieres en Suspension)),
W72-09455 5A

Rapid Methods for Radioactive Environmental Monitoring in the Federal Republic of Germany, (Schnellmethoden Zur Uberwachung Der Radioaktivitat in Der Bundesrepublik Deutschland),
W72-09456 5A

Rapid Methods for Specific Radionuclide Analysis and their Application to Aquatic Emergency Conditions,
W72-09457 5A

System for Measuring Organic Content of Water,
W72-09493 5D

Tropospheric Scavenging of 90Sr and 3H,
W72-09528 5A

Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

The Role of the U.S. Geological Survey in Waste Disposal Monitoring,
W72-09616 5B

Float Implosion in Observation Well in Kentucky,
W72-09621 4B

Ice Monitoring Equipment,
W72-09626 2C

Water Quality Control in Oregon.
W72-09669 5G

Monitoring Metals in Marine Animals,
W72-09718 5A

Heavy Metals in United States Fish,
W72-09719 5B

MONTANA

Western Unit Flood Protection Project, Billings, Montana (Draft Environmental Impact Statement).
W72-09482 4A

Water Resources Investigations in Montana, 1969.
W72-09535 7C

MORA COUNTY (N MEX)

Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

MORTALITY

Possible DDT Mortality in Young Rainbow Trout,
W72-09141 5C

MOSCOW OBLAST

Moisture Variations in a Model Sod-Podzolic Soil (O nekotorykh zakonomernostyakh var-'irovaniya vlazhnosti v model'noy dernovo-podzolistoy pochve),
W72-09748 2G

MOSQUITOES

Laboratory Release Rate Studies of Dursban-Polymeric Formulations, March-July 1970,
W72-09676 5B

Polymer Formulations of Dursban and Abate as Mosquito Larvicides, April - October, 1970,
W72-09720 5B

MOUNTAINS

Mountain-Peak Potential-Gradient Measurements and the Andes Glow,
W72-09219 2B

MOVING BED FILTER

MBF Pilot Plant Filtration of Combined Municipal and Paper Mill Waste,
W72-09301 5D

MULLETS

Dynamics of the Fat Content in the Bodies of Mugil saliens Risso Grown in the Shabolatsky Estuary, (In Russian),
W72-09185 2L

Kerosene-Like Tainting in Australian Mullet,
W72-09678 5C

MULTILEVEL OUTLETS

Selective Withdrawal Studies for the Fish Hatchery Outlets at Pueblo Dam--Mathematical and Physical Models,
W72-09194 8B

MULTIPLE PASS DESALINATION

Evaluation of Single and Multiple Pass Seawater Desalination.
W72-09518 3A

MUNICIPAL WASTES

MBF Pilot Plant Filtration of Combined Municipal and Paper Mill Waste,
W72-09301 5D

The Use of Sewage Effluent at South African Pulp and Paper Industries' Enstra Bleached Kraft Mill,
W72-09399 5D

Design of the Beddington Works of the London Borough of Croydon,
W72-09400 5D

Operation of Bybrook Sewage Works, Ashford, Kent, 1965-68,
W72-09401 5D

Waste Water Treatment Process,
W72-09492 5D

Flotation of Solids from Waste Waters,
W72-09496 5D

Toxicity Assessment of Treated Municipal Wastewaters,
W72-09582 5D

MUNICIPAL WATER

Basin Management for Water Reuse.
W72-09381 5D

MUSSELS

Comparison of Methods of Estimating the Number of Escherichia coli in Edible Mussels and the Relationship between the Presence of Salmonellae and E. coli,
W72-09319 5A

MYCOBACTERIA

Mycobacteria of Sewage Water and Sediment, (In French),
W72-09777 5A

NAPOLEON (OHIO)

Handling Waste Disposal at a Major Food Plant,
W72-09591 5D

NATURAL DRAFT

A Method for Predicting the Performance of Natural Draft Cooling Towers.
W72-09726 5D

NATURAL STREAMS

Mechanism of Hydrogen Ion Buffering in Natural Waters,
W72-09687 5F

NAVIGABLE RIVERS

Aeration Systems for Large Navigable Rivers,
W72-09196 5G

NAVIGATION

Interoceanic Canal Studies, 1970.
W72-09430 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 15-16,
W72-09435 8A

Lagoon Pond Navigation Project, Martha's Vineyard, Massachusetts (Final Environmental Impact Statement).
W72-09463 4A

Ice Cover Formation and Associated Hydro-Dynamic Effects in the Lower Part of the River Rhine,
W72-09634 2C

Flushing Studies, Victorial Channel, Victoria, Texas: Hydraulic Model Investigation,
W72-09761 8B

Status Report on the Gastineau Channel Model Study,
W72-09762 8B

NEBRASKA

Characteristics of Streamflow at Gaging Stations in Shell Creek, Elkhorn River, and Salt Creek Basins, Nebraska,
W72-09556 2E

NEBRASKA

Water supplies and the Land--The Elkhorn River Basin of Nebraska,
W72-09557 7C

Use of Groundwater for Irrigation in Clay County, Nebraska, 1970,
W72-09756 4B

NECROSIS VIRUS
Infectious Pancreatic Necrosis Virus: Comparative Frequencies of Isolation From Feces and Organs of Brook Trout (Salvelinus fontinalis),
W72-09152 5A

NEGLIGENCE
Le Van V. Hedlund Plumbing and Heating (Adjacent Landowners Obligation to Accept Natural Drainage of Surface Waters).
W72-09469 6E

NETHERLANDS
Ice Cover Formation and Associated Hydro-Dynamic Effects in the Lower Part of the River Rhine,
W72-09634 2C

NETWORK DESIGN
A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

NEUSE RIVER
Fallout Cesium-137 in Clams (Rangia Cuneata) From the Neuse River Estuary, North Carolina,
W72-09337 5A

NEUTRALIZATION
Plating and Industrial Waste Treatment at the Expanded Plant of Fisher Body, Elyria, Ohio,
W72-09594 5D

NEUTRON ACTIVATION ANALYSIS
The Toluene Extraction of Some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part 1. Extraction Behaviour of As, Au, Bi, Br, Cd, Cu, Ga, Ge, In, Hg, Mo, Pb, Sb, Se, Sn, W and Zn,
W72-09367 5A

The Toluene Extraction of some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part II. Determination of Arsenic and Antimony in Biological Materials at Su bmicrogram Levels,
W72-09368 5A

Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

NEW ENGLAND
Water Budget Analysis of a New England Wetland,
W72-09265 3B

NEW JERSEY
A Master Sewerage Plan for Burlington County, New Jersey.
W72-09303 6D

Occurrence and Distribution of Trace Elements in New Jersey Streams,
W72-09545 5A

Water Resources Investigations in New Jersey, 1968.
W72-09767 7C

NEW MEXICO
The Potential Contribution of Desalting to Future Water Supply in New Mexico,
W72-09306 3A

Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

Land Classification for Irrigation, Torrance County,
W72-09664 3F

Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

NEW YORK
Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

Activated Sludge Processing.
W72-09389 5D

Hudson River Channel, New York--Operation and Maintenance Action (Draft Environmental Impact Statement).
W72-09483 4A

A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

NEW ZEALAND
Environmental Radioactivity in New Zealand. Quarterly Report, Oct.-Dec. 1970.
W72-09429 5A

NIAGARA RIVER
Investigations into Frazil, Bottom Ice and Surface Ice Formation in the Niagara River,
W72-09632 2C

NICHE DEFINITION
Ecological Niches of Sympatric Phytoplankton Species,
W72-09180 5C

NICHES
Ecological Niches of Sympatric Phytoplankton Species,
W72-09180 5C

NICKEL
The Determination of Traces of Nickel by Gas-Liquid Chromatography,
W72-09369 5A

NIGERIA
Rural Water Supply in the Basement Complex of Western State, Nigeria,
W72-09275 3B

NITELLA FLEXILIS
Water Movement in a Plant Cell on Application of Hydrostatic Pressure,
W72-09786 2I

NITRATES
Diurnal Uptake of NO3 and NH4 by a Ceratophyllum-Periphyton Community,
W72-09406 5C

NITRATES PHOSPHORUS
Quality of Effluent from Swine Production Areas,
W72-09151 5B

NITRIFICATION
Factors Affecting Nitrification Kinetics,
W72-09174 5D

NITRILOTRIACETIC ACID
The Determination of Nitrilotriacetic Acid (NTA) In Sewage and Sewage Effluent,
W72-09251 5A

Sunlight Photochemistry of Ferric Nitrilotriacetate Complexes,
W72-09379 5A

Determination of Nitrilotriacetic acid in Inland Waters by Gas Chromatography of the Trimethyl Ester,
W72-09711 5A

NITROGEN
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

Diurnal Uptake of NO3 and NH4 by a Ceratophyllum-Periphyton Community,
W72-09406 5C

Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

NITROGEN COMPOUNDS
Photochemistry of Bioactive Compounds. Solution-Phase Photochemistry of Asymmetric Triazin-5 (4H)-Ones,
W72-09250 5B

NITROGEN CYCLE
Soil Nitrogen Cycle--A Bibliography.
W72-09299 2G

NITROGEN FIXATION
Nitrogen Fixation by Bacteria in Lake Mize, Florida, and in Some Lacustrine Sediments,
W72-09579 5C

NOMOGRAMS
Estimation of the Occurrence of Hail and Hailstone Sizes,
W72-09206 2B

NON-TARGET ORGANISMS
Effects of Polymer Formulations of Dursban and Abate on Non-Target Organism Populations, April - October, 1970,
W72-09721 5C

NONIONIC SURFACTANTS
Nuclear Magnetic Resonance Study of Interaction between Anionic and Nonionic Surfactants in their Mixed Micelles,
W72-09410 5A

NORTH CAROLINA
Geology and Ground-Water Resources of Northwestern North Carolina,
W72-09264 4B

Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

Fallout Cesium-137 in Clams (Rangia Cuneata) From the Neuse River Estuary, North Carolina,
W72-09337 5A

Tallulah Creek Watershed (Long Creek Portion), North Carolina (Draft Environmental Impact Statement).
W72-09475 8A

Proceedings - Workshop on Sediment Control.
W72-09656 4D

NORTH PLATTE RIVER BASIN
A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

NORTH SLOPE
Arctic Waste Management,
W72-09601 5D

NORTHWESTERN NORTH CAROLINA
Geology and Ground-Water Resources of Northwestern North Carolina,
W72-09264 4B

NORWAY
Measurements of Ice Roughness and the Effect of Ice Cover on Water Levels in Three Norwegian Rivers,
W72-09638 2C

NOVOSIBIRSK OBLAST
Water Erosion of Soils in the Ob' River Region Near Novosibirsk (Vodnaya eroziya pochv Novosibirskogo Priob'ya),
W72-09281 2J

NUCLEAR ENGINEERING
Public Safety and Underground Nuclear Detonations,
W72-09427 5G

NUCLEAR EXPLOSIONS
Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

Public Safety and Underground Nuclear Detonations,
W72-09427 5G

Environmental Radioactivity in New Zealand. Quarterly Report, Oct.-Dec. 1970.
W72-09429 5A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 1-4.
W72-09431 8A

A Quick and Convenient Measurement Method for Surface and Liquid Contamination Using the TLD System,
W72-09451 5A

Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

Sampling and Analytical Systems for Measuring Environmental Radioactivity,
W72-09453 5A

Infill of Nuclear Rubble Chimneys by Ground Water,
W72-09617 4B

NUCLEAR MAGNETIC RESONANCE
Lanthanide Shift Reagents as an Aid in the NMR Analysis of the Normal Alcohols C6 to C11,
W72-09347 5A

Nuclear Magnetic Resonance Study of Interaction between Anionic and Nonionic Surfactants in their Mixed Micelles,
W72-09410 5A

NUCLEAR POWERPLANTS
Plan for the Management of AEC-Generated Radioactive Wastes,
W72-09424 5G

The Nuclear Power Industry's Need for Rapid and Accurate Estimation of Radioactivity in the Environment,
W72-09438 5A

Rapid Determination of Gamma-Ray Emitting Radionuclides in Water (Schnelle Bestimmung Gammastrahlender Radionuklide in Wassern),
W72-09445 5A

Sampling and Analytical Systems for Measuring Environmental Radioactivity,
W72-09453 5A

Electric Power and the Environment.
W72-09529 6G

Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

Present Status of the U.S. Program on the Solidification of High Level Wastes,
W72-09584 5D

NUCLEAR WASTES
Rapid Methods for Specific Radionuclide Analysis and their Application to Aquatic Emergency Conditions,
W72-09457 5A

Columbia River Studies, Annual Progress Report 1970-1971,
W72-09670 5C

NUISANCE (LEGAL ASPECTS)
Cook Industries V. Carlson (Right of Summary Abatement of Private Nuisance).
W72-09471 6E

NUMERICAL ANALYSIS
Numerical Methods for Determining Streamlines and Isopressures for Use in Fluid-Flow Studies,
W72-09754 2F

NUTAGENS
Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

NUTRIENT FLUX
Nutrient Flux in Estuaries,
W72-09172 5C

NUTRIENT TRAPS
Insidious Alteration of the Estuarine Environment,
W72-09717 5C

NUTRIENTS
The Role of Minor Nutrients in Limiting the Productivity of Aquatic Ecosystems,
W72-09158 5C

Phytoplankton Photosynthesis, Micronutrient Interactions, and Inorganic Carbon Availability in a Soft-Water Vermont Lake,
W72-09160 5C

Algal Responses to Nutrient Additions in Natural Waters. I. Laboratory Assays,
W72-09164 5C

Algal Responses to Nutrient Additions in Natural Waters. II. Field Experiments,
W72-09165 5C

Nutrients and Phytoplankton in Lake Washington,
W72-09167 5C

Nutrient Flux in Estuaries,
W72-09172 5C

Response of Escherichia Coli B/r to High Concentrations of Sucrose in a Nutrient Medium,
W72-09364 5C

Phosphorus and Eutrophication in the Pamlico River Estuary, N. C., 1966-1969 - A Summary,
W72-09655 5C

OAHU (HAWAII)
Reconnaissance Study of Sediment Transported by Streams, Island of Oahu,
W72-09759 2J

OAK CREEK (ORE)
Emergence Trap Collections of Trichoptera from an Oregon Stream,
W72-09571 5A

OASES
Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

OB' RIVER
Water Erosion of Soils in the Ob' River Region Near Novosibirsk (Vodnaya eroziya pochv Novosibirskogo Priob'ya),
W72-09281 2J

Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

OBSERVATION WELLS
Float Implosion in Observation Well in Kentucky,
W72-09621 4B

OCEAN DUMPING
Disposal of Solid Aluminum Process Wastes in the Ocean,
W72-09552 5C

OCEAN WAVES
Determination of the Zone of Origin of Tsunamis (Opredeleniye mesta vozniknoveniya tsunami),
W72-09280 2L

The Approximate Theories of Pneumatic Wave Generators,
W72-09541 8B

OCEANOGRAPHY
On the Water of the Canadian Arctic Archipelago, an Atlas Presentation of 1961 and 1962 Data,
W72-09227 7C

Distribution and Composition of Carbonates in the Upper Layer of Bottom Sediments of the Atlantic Ocean (Raspredelenive i sostav karbonatov v verkhnem sloye donnykh osadkov Atlanticheskogo okeana),
W72-09256 2J

Bomex Temporary Archive Description of Available Data,
W72-09263 7C

History of the World's Oceans (Istoriya Mirovogo okeana).
W72-09282 2L

OCEANS
History of the World's Oceans (Istoriya Mirovogo okeana).
W72-09282 2L

A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

ODOR
Photographic Studies of the Dunging Behavior of Pigs in Confinement,
W72-09153 5G

Research on Algal Odor,
W72-09694 5F

Studies on Actinomycetes and Their Odors,
W72-09696 5F

OFFSHORE PLATFORMS
The Santa Barbara Oil Spill Part 1: Initial Quantities and Distribution of Pollutant Crude Oil,
W72-09682 5B

OHIO
Hydrologic Investigation of Small Watersheds in Ohio, Phase I: 1966-1969,
W72-09296 2A

Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

OIL
The Effects of Oil on Sewers and Treatment Plants,
W72-09395 5D

Study of Crude Oil and Some of its High Molecular Compounds Using Electron Paramagnetic Resonance (Review),
W72-09404 5A

The Operation of Pressure Type Sand Filters for Hot Mill Waste Waters,
W72-09587 5D

Effects of Petroleum Fractions on the Early Development of a Sea Urchin,
W72-09677 5C

OIL CHARACTERIZATION
The Analysis of Nitrogen Containing Polymeric Ashless Oil Dispersants by Dialysis and Alumina Chromatography,
W72-09376 5A

OIL POLLUTION
International and National Approaches to Oil Pollution Responsibility: An Emerging Regime for a Global Problem,
W72-09467 5G

President Nixon asks Senate Approval of Conventions on Pollution of the Sea by Oil,
W72-09485 6E

Offshore Oil Pollution (Message from President Nixon to Congress),
W72-09486 6E

Process for Cleaning up Oil Spills,
W72-09490 5G

Apparatus for Controlling the Dispersion of Pollutants Floating on a Body of Water,
W72-09494 5G

Boom for Oil Spilt on Water,
W72-09495 5G

Method of and Apparatus for Skimming Flotsam from the Surface of a Body of Water,
W72-09499 5G

Oil Slick Elimination,
W72-09501 5G

Apparatus to Confine and Recover Oil Spillage at Sea,
W72-09507 5G

Floating Oil Containment Apparatus,
W72-09508 5G

Separator for Nonmiscible Liquids,
W72-09509 5G

Oil Spill Removal Method,
W72-09510 5G

Floating Contaminant Constraining Fence,
W72-09512 5G

Effects of Petroleum Fractions on the Early Development of a Sea Urchin,
W72-09677 5C

The Santa Barbara Oil Spill Part 1: Initial Quantities and Distribution of Pollutant Crude Oil,
W72-09682 5B

The Santa Barbara Oil Spill Part 2: Initial Effects on Intertidal and Kelp Bed Organisms,
W72-09683 5C

OIL SOLUBLE SULFONATES
The Determination of Oil-Soluble Sulphonates by Two-Phase Titration,
W72-09375 5A

OIL SPILL CONTAINMENT
Dynamics of Contained Oil Slicks,
W72-09258 5G

OIL SPILLS
Dynamics of Contained Oil Slicks,
W72-09258 5G

International and National Approaches to Oil Pollution Responsibility: An Emerging Regime for a Global Problem,
W72-09467 5G

Offshore Oil Pollution (Message from President Nixon to Congress),
W72-09486 6E

Process for Cleaning up Oil Spills,
W72-09490 5G

Boom for Oil Spilt on Water,
W72-09495 5G

Method of and Apparatus for Skimming Flotsam from the Surface of a Body of Water,
W72-09499 5G

Oil Slick Elimination,
W72-09501 5G

Floating Oil Containment Apparatus,
W72-09508 5G

Oil Spill Removal Method,
W72-09510 5G

Floating Contaminant Constraining Fence,
W72-09512 5G

The Santa Barbara Oil Spill Part 1: Initial Quantities and Distribution of Pollutant Crude Oil,
W72-09682 5B

The Santa Barbara Oil Spill Part 2: Initial Effects on Intertidal and Kelp Bed Organisms,
W72-09683 5C

OIL WASTES
Dynamics of Contained Oil Slicks,
W72-09258 5G

Experimental Evaluation of Fibrous Bed Coalescers for Separating Oil-Water Emulsions.
W72-09580 5D

Stabilization of Refinery Waste Water with the Activated Sludge Process: Determination of Design Parameters,
W72-09593 5D

The Treatment of Industrial Wastewater for Reuse--Chrysler Indianapolis Foundry,
W72-09600 5D

OILY WATER
The Role of the Diffuse Layer in Water-In-Oil Microemulsions,
W72-09335 5A

ON-SITE TESTS
Algal Responses to Nutrient Additions in Natural Waters. II. Field Experiments,
W72-09165 5C

Field Tests of the 345 KV Series Compensated Glen Canyon-Pinnacle Peak Transmission Lines--Colorado River Storage Project,
W72-09192 8C

Voltammetric Measurement of Zinc in the Northeastern Tropical Pacific Ocean,
W72-09413 5A

Testing New Sewer Pipe Installations,
W72-09595 5D

OPERATING COSTS
Capital and Operating Costs--AWT,
W72-09140 5D

Power Plant Siting, Performance, and Economics with Dry Cooling Tower Systems,
W72-09741 5D

OPERATION AND MAINTENANCE
Filtration of Water and Wastewater,
W72-09393 5D

OPERATIONS RESEARCH
Optimal Search for Pollution Sources,
W72-09232 5B

Water Treatment Plant Staging Policy,
W72-09289 5F

OPTICAL PROPERTIES
The Relation of Snow Transparency to Density and Air Permeability in a Natural Snow Cover,
W72-09607 2C

OPTIMALITY CONDITIONS
Externalities and Public Goods,
W72-09143 6A

OPTIMIZATION
Optimal Distribution of Water to Irrigation Canals,
W72-09195 3F

Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

Optimal Search for Pollution Sources,
W72-09232 5B

Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

Water Treatment Plant Staging Policy,
W72-09289 5F

Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

OREGON
Applications of Some Numerical Models to Pacific Northwest Estuaries,
W72-09549 5B

Emergence Trap Collections of Trichoptera from an Oregon Stream,
W72-09571 5A

Water Quality Control in Oregon.
W72-09669 5G

ORGANIC ACIDS
Gas-Solid Chromatography of Organic Compounds using Steam as the Carrier Gas,
W72-09566 5A

ORGANIC COMPOUNDS
Growth of Obligate Autotrophic Bacteria on Glucose in a Continuous Flow-Through Apparatus,
W72-09318 5C

Displacement Chromatography of Hydrocarbons,
W72-09563 5A

Gas-Solid Chromatography of Organic Compounds using Steam as the Carrier Gas,
W72-09566 5A

ORGANIC LOADING
Organic Concentration and Hydraulic Loading Versus Organic Loading in Evaluation of Trickling Filter Performance,
W72-09596 5D

ORGANIC MATTER
Waste Water Treatment Process,
W72-09492 5D

System for Measuring Organic Content of Water,
W72-09493 5D

Stoichiometry of the Coagulation of Color-Causing Organic Compounds with Ferric Sulfate,
W72-09695 5F

ORGANIC PESTICIDES
Photochemistry of Bioactive Compounds. Solution-Phase Photochemistry of Asymmetric Triazin-5 (4H)-Ones,
W72-09250 5B

ORGANIC SOILS
Water Table Drawdown Around an Open Ditch in Organic Soils,
W72-09268 4A

ORGANIC WASTES
System for Measuring Organic Content of Water,
W72-09493 5D

Process for Removal of Inorganic and Organic Matter from Waste Water Systems,
W72-09500 5D

ORGANIZATIONS
List of Organizations, Meetings, Programmes, Etc., Related to Fisheries,
W72-09262 7A

ORGANOMETALLIC SYSTEMS
Burner Memory Following Atomic Absorption Spectrophotometric Analysis of Moderately Volatile Organometallic Complexes,
W72-09247 5A

ORGANOPHOSPHORUS
Hydrolysis and Solvent Partition of Phosdrin and Related Organophosphates,
W72-09321 5B

ORGANOPHOSPHORUS PESTICIDES
Column Extraction of Pesticides from Fish, Fish Food and Mud,
W72-09315 5A

OROGRAPHIC PRECIPITATION
Atmospheric Precipitation in the Armenian SSR (Atmosfernyye osadki v Armyanskoy SSR),
W72-09746 2B

OROGRAPHIC RAINFALL
Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

OROGRAPHY
Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

OSMOTIC POTENTIAL
Effect of Osmotic and Matric Potentials on the Availability of Water for Seed Germination,
W72-09773 2I

OSMOTIC PRESSURE
The Water Economy of the Sea Grass Thalassia testudinum,
W72-09784 2L

OSWEGO RIVER BASIN SYSTEM
Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

OUACHITA RIVER BASIN
Water and Land Resources, Ouachita River Basin in Arkansas,
W72-09309 6D

OUTER BANKS (NC)
Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

OUTLETS
Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

OV-SILICONE COLUMNS
Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

OWNERSHIP OF BEDS
U.N. Adopts Principles Governing Seabed Exploitation and Decides to Convene Comprehensive Law-of-the-Sea Conference in 1973.
W72-09484 6E

OXIDATION
Electro-Oxidation of Iodine on Smooth Platinum in Aqueous Media,
W72-09245 5A

Plating and Industrial Waste Treatment at the Expanded Plant of Fisher Body, Elyria, Ohio,
W72-09594 5D

OXIDATION LAGOONS
Waste Treatment Lagoons-State of the Art.
W72-09386 5D

OXIDATION-REDUCTION POTENTIAL
Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

OXYGEN TRANSFER
Biological Factors in Aerator Performance,
W72-09602 5D

OXYGEN UTILIZATION
Development and Use of a Large-Volume Automatic Respirometer,
W72-09396 5D

OXYGENATION
Aeration Systems for Large Navigable Rivers,
W72-09196 5G

Activated Sludge Processing.
W72-09389 5D

Apparatus for Reoxygenating a Body of Water,
W72-09503 5G

Biological Factors in Aerator Performance,
W72-09602 5D

OYSTERS
The Rate of Loss of Mercury by Pacific Oysters,
W72-09667 5A

Zinc Retention in Young Rats Fed Increasing Levels of High-Zinc Oysters,
W72-09716 5C

OZONE
The Ozonization of Turret and Other Scottish Waters,
W72-09690 5F

PACIFIC NORTHWEST U. S.
Proceedings, 1971 Technical Conference on Estuaries of the Pacific Northwest.
W72-09547 5B

The Potential of Physical Models to Investigate Estuarine Water Quality Problems,
W72-09548 5B

Applications of Some Numerical Models to Pacific Northwest Estuaries,
W72-09549 5B

PACIFIC OCEAN
Voltammetric Measurement of Zinc in the Northeastern Tropical Pacific Ocean,
W72-09413 5A

Disposal of Solid Aluminum Process Wastes in the Ocean,
W72-09552 5C

PAMLICO RIVER ESTUARY (N.C.)
Phosphorus and Eutrophication in the Pamlico River Estuary, N. C., 1966-1969 - A Summary,
W72-09655 5C

PANAMA CANAL
Interoceanic Canal Studies, 1970.
W72-09430 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 1-4.
W72-09431 8A

Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 5-8.
W72-09432 8A

Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 9-11.
W72-09433 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 12-14.
W72-09434 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 15-16,
W72-09435 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendix 17. A Bibliography.
W72-09436 8A

PARTICLE SIZE
Experiments on the Generation of Raindrop-Size Distributions by Drop Breakup,
W72-09203 2B

Experimental Studies of Freezing, Wake Effect, and Breakup of Freely Suspended Supercooled Water Drops,
W72-09204 2B

Design, Construction and Testing of the Dropsonde,
W72-09211 2B

A Practical On-Stream Particle Size Analysis System,
W72-09372 7B

Instrumentation for In-Situ Determination of Ice Particle Size Distribution,
W72-09513 3A

PARTICLE SIZE ANALYZER
Instrumentation for In-Situ Determination of Ice Particle Size Distribution,
W72-09513 3A

PASTURE
Perennial Grass Mixtures for Hay-Pasture Use of Low-Productive and Eroded Lands Under Dry Farming Conditions, (In Bulgarian),
W72-09772 3F

PATENTS
Variable Orifice for Multistage Flash Evaporation or Distillation Units,
W72-09487 3A

Treatment of Sewage Digester Supernatant Liquor,
W72-09488 5D

Method and Apparatus for Withdrawing Heat from Industrial Plants, Especially Power Plants,
W72-09489 5D

Process for Cleaning up Oil Spills,
W72-09490 5G

Chitin and Chitosan as Chromatographic Supports and Absorbents for Collection of Metal Ions from Organic and Aqueous Solutions and Sea Water,
W72-09491 2K

Waste Water Treatment Process,
W72-09492 5D

System for Measuring Organic Content of Water,
W72-09493 5D

Apparatus for Controlling the Dispersion of Pollutants Floating on a Body of Water,
W72-09494 5G

Boom for Oil Spilt on Water,
W72-09495 5G

Flotation of Solids from Waste Waters,
W72-09496 5D

Removal of Inorganic Species by Liquid Membrane,
W72-09497 5D

Method of and Apparatus for Skimming Flotsam from the Surface of a Body of Water,
W72-09499 5G

Process for Removal of Inorganic and Organic Matter from Waste Water Systems,
W72-09500 5D

Oil Slick Elimination,
W72-09501 5G

Biochemical Process,
W72-09502 5D

Apparatus for Reoxygenating a Body of Water,
W72-09503 5G

Method and Apparatus for Desilting and/or Desalting Bodies of Water,
W72-09504 4A

Flocculation of Particles Dispersed in Aqueous Media and Flocculants Used Therein,
W72-09505 5D

Evaporation-Reverse Osmosis Water Desalination System,
W72-09506 3A

Apparatus to Confine and Recover Oil Spillage at Sea,
W72-09507 5G

Floating Oil Containment Apparatus,
W72-09508 5G

Separator for Nonmiscible Liquids,
W72-09509 5G

Oil Spill Removal Method,
W72-09510 5G

Floating Breakwater,
W72-09511 4A

Floating Contaminant Constraining Fence,
W72-09512 5G

PATH OF POLLUTANTS
Dynamics of Contained Oil Slicks,
W72-09258 5G

DDT Residues in Salinas River Sediments,
W72-09313 5B

Variations of Sulfur Isotope Ratios in Samples of Water and Air near Chicago,
W72-09336 5B

Adsorption of Lindane and Dieldrin Pesticides on Unconsolidated Aquifer Sands,
W72-09539 5B

Remote Sensing Acquisition of Tracer Dye and Infrared Imagery Information and Interpretation for Industrial Discharge Management,
W72-09550 5B

The Role of the U.S. Geological Survey in Waste Disposal Monitoring,
W72-09616 5B

Migration and Leaching of Metals from Old Mine Tailings Deposits,
W72-09620 5B

Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

The Relationships Between 32P Accumulation in Algae, Bacteria and Tubificids,
W72-09668 5C

Research on the Physical Aspects of Thermal Pollution.
W72-09728 5B

PATHOGENIC BACTERIA
Summer Conference of Society for Applied Bacteriology, Liverpool, 13-15 July 1971,
W72-09675 5C

PATHOLOGY
Problems in Water Toxicology (Voprosy vodnoy toksikologii).
W72-09646 5C

PEAS
Liquid Wastes from Canning and Freezing Fruits and Vegetables.
W72-09390 5D

PEAT
Penetration of Bog Peats and Lake Sediments by Tritium From Atmospheric Fallout,
W72-09240 5B

Water Table Drawdown Around an Open Ditch in Organic Soils,
W72-09268 4A

PENAEUS SETIFERUS
Catches of Postlarval White Shrimp, 'Penaeus setiferus' (Linn.), and Brown Shrimp, P. aztecus ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967,
W72-09674 2L

PENETRATION
Penetration of Bog Peats and Lake Sediments by Tritium From Atmospheric Fallout,
W72-09240 5B

PENNSYLVANIA
Gypsy Moth Suppression Project (Final Environmental Impact Statement).
W72-09466 5G

PENSACOLA (FLA)
Availability of Ground Water for Public-Water Supply in the Pensacola Area, Florida,
W72-09267 4B

PENTACHLOROPHENOL
Methylation of Pentachlorophenol by Trichoderma Virgatum,
W72-09562 5B

PERENNIALS
Pattern in Desert Perennials,
W72-09333 2I

PERFORMANCE
Operation of Bybrook Sewage Works, Ashford, Kent, 1965-68,
W72-09401 5D

Power Plant Siting, Performance, and Economics with Dry Cooling Tower Systems,
W72-09741 5D

PERIOD OF GROWTH
Seasonal and Diurnal Changes in Moisture Contents and Water Deficits of Engelmann Spruce Needles,
W72-09606 2I

PERIPHYTON
Diurnal Uptake of NO3 and NH4 by a Ceratophyllum-Periphyton Community,
W72-09406 5C

PERMAFROST
Permafrost Erosion Along the Beaufort Sea Coast,
W72-09546 2J

PERMITS
Attorney General V. Baldwin (Noncompliance with Terms of Permit to Fill).
W72-09470 6E

PESTICIDE DISTRIBUTION
Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

PESTICIDE KINETICS
Photochemistry of Bioactive Compounds. Solution-Phase Photochemistry of Asymmetric Triazin-5 (4H)-Ones,
W72-09250 5B

Uptake, Assimilation, and Loss of DDT Residues by Euphausia pacifica, A Euphausid Shrimp,
W72-09519 5C

PESTICIDE RESIDUES
DDT Residues in Salinas River Sediments,
W72-09313 5B

Micro Scale Alkali Treatment for use in Pesticide Residue Confirmation and Sample Cleanup,
W72-09314 5A

Determination of Carbetamide Residues and its Aniline Metabolite,
W72-09316 5A

Problem of Pesticides in Water Toxicology (Problema pestitsidov v vodnoy toksikologii),
W72-09650 5C

Effects of Pesticides on the Life of a Water Body (K voprosu o vliyanii pestitsidov na zhizn' vodoyema),
W72-09651 5C

Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

A Method for the Analysis of Fish, Animal, and Pultry Tissue for Chlorinated Pesticide Residues,
W72-09684 5A

Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

PESTICIDE TOXICITY
Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

Effects of Organochlorine Insecticides on Bacterial Growth, Respiration and Viability,
W72-09361 5C

The Temporary Abatement of Nuisance Species of Trichoptera with DDD (TDE) Larvicide,
W72-09412 5C

Gypsy Moth Suppression Project (Final Environmental Impact Statement).
W72-09466 5G

Methylation of Pentachlorophenol by Trichoderma Virgatum,
W72-09562 5B

Problem of Pesticides in Water Toxicology (Problema pestitsidov v vodnoy toksikologii),
W72-09650 5C

Effects of Pesticides on the Life of a Water Body (K voprosu o vliyanii pestitsidov na zhizn' vodoyema),
W72-09651 5C

Effects of Polymer Formulations of Dursban and Abate on Non-Target Organism Populations, April - October, 1970,
W72-09721 5C

PESTICIDES
Thin Layer Chromatography and Infra-Red and Ultra-Violet Spectra of Fenthion and Seven of its Degradation Products,
W72-09182 5A

Appearance of 1-Hydroxychlordene in Soil, Crops, and Fish,
W72-09317 5A

Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

Adsorption of Lindane and Dieldrin Pesticides on Unconsolidated Aquifer Sands,
W72-09539 5B

Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

Problem of Pesticides in Water Toxicology (Problema pestitsidov v vodnoy toksikologii),
W72-09650 5C

Effects of Pesticides on the Life of a Water Body (K voprosu o vliyanii pestitsidov na zhizn' vodoyema),
W72-09651 5C

Possible Effects of Organochlorine Pesticides on Primary Productivity and Skeletogenesis of New England Estuarine and Coastal Marine Algae,
W72-09653 5C

Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

PHENOLOGY
Emergence of Caddisflies (Trichoptera) and Mayflies (Ephemeroptera) from Heming Lake, Manitoba,
W72-09570 5C

PHENOLS
Process for Removal of Inorganic and Organic Matter from Waste Water Systems,
W72-09500 5D

PHOSDRIN
Hydrolysis and Solvent Partition of Phosdrin and Related Organophosphates,
W72-09321 5B

PHOSPHATE
Wastewater Demineralization by Ion Exchange,
W72-09384 5D

Phosphate Precipitation with Ferrous Iron,
W72-09388 5D

PHOSPHATES
Detergents: Nutrient Considerations and Total Assessment,
W72-09169 5C

Response of Rice to Phosphate Manuring in a Waterlogged Lateritic Sandy Loam of Kerala,
W72-09578 3F

Decontamination of Radioactive Aqueous Effluent by the Calcium-Ferric Phosphate Process,
W72-09692 5F

PHOSPHORUS
Nutrients and Eutrophication: The Limiting Nutrient Controversy.
W72-09155 5C

The Interrelation of Carbon and Phosphorus in Regulating Heterotrophic and Autotrophic Populations in an Aquatic Ecosystem, Shriner's Pond,
W72-09159 5C

Characterization of Phosphorus-Limited Plankton Algae,
W72-09163 5C

Phosphorus, Silica, and Eutrophication of Lake Michigan,
W72-09166 5C

Nutrient Flux in Estuaries,
W72-09172 5C

Phosphorus in Wastewater Effluents and Algal Growth,
W72-09176 5C

Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

Treatment of Sewage Digester Supernatant Liquor,
W72-09488 5D

Phosphorus and Eutrophication in the Pamlico River Estuary, N. C., 1966-1969 - A Summary,
W72-09655 5C

PHOSPHORUS RADIOISOTOPES
The Relationships Between 32P Accumulation in Algae, Bacteria and Tubificids,
W72-09668 5C

PHOSPHOTHIOATE PESTICIDES
Laboratory Release Rate Studies of Dursban-Polymeric Formulations, March-July 1970,
W72-09676 5B

PHOTOACTIVATION
Release of Dissolved Organic Matter from Natural Populations of Marine Phytoplankton,
W72-09363 5C

PHOTOCHEMISTRY
Photochemistry of Bioactive Compounds. Solution-Phase Photochemistry of Asymmetric Triazin-5 (4H)-Ones,
W72-09250 5B

Rapid Photochemical Determination of Uranium (VI) At Trace Levels,
W72-09254 5A

PHOTODECOMPOSITION
Sunlight Photochemistry of Ferric Nitrilotriacetate Complexes,
W72-09379 5A

PHOTOENDRIN
Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

PHOTOREDUCTION
Rapid Photochemical Determination of Uranium (VI) At Trace Levels,
W72-09254 5A

PHOTOSYNTHESIS
Phytoplankton Photosynthesis, Micronutrient Interactions, and Inorganic Carbon Availability in a Soft-Water Vermont Lake,
W72-09160 5C

Chalcocite Oxidation and Coupled Carbon Dioxide Fixation by Thiobacillus Ferrooxidans,
W72-09359 5C

A Direct Method of Measuring Benthic Primary Production in Streams,
W72-09405 5A

Possible Effects of Organochlorine Pesticides on Primary Productivity and Skeletogenesis of New England Estuarine and Coastal Marine Algae,
W72-09653 5C

Mechanism of Hydrogen Ion Buffering in Natural Waters,
W72-09687 5F

PHOTOSYNTHETIC BACTERIA
Growth of Obligate Autotrophic Bacteria on Glucose in a Continuous Flow-Through Apparatus,
W72-09318 5C

PHOTOSYNTHETIC PRODUCTS
Effects of Water Deficiency on Transfer of Assimilates From Leaves Into Fruit Organs of Cotton, (In Russian),
W72-09776 3F

PHYTOPLANKTON
Phytoplankton Photosynthesis, Micronutrient Interactions, and Inorganic Carbon Availability in a Soft-Water Vermont Lake,
W72-09160 5C

Nutrients and Phytoplankton in Lake Washington,
W72-09167 5C

Ecological Niches of Sympatric Phytoplankton Species,
W72-09180 5C

Species and Individual Productivity in Phytoplankton Communities,
W72-09239 5C

Release of Dissolved Organic Matter from Natural Populations of Marine Phytoplankton,
W72-09363 5C

PIL SPILLS
Apparatus to Confine and Recover Oil Spillage at Sea,
W72-09507 5G

PILOT PLANTS
MBF Pilot Plant Filtration of Combined Municipal and Paper Mill Waste,
W72-09301 5D

Chemical-Physical Wastewater Treatment Phase 2: Activated Carbon Adsorption and Polishing,
W72-09302 5D

Wastewater Demineralization by Ion Exchange,
W72-09384 5D

The Ozonization of Turret and Other Scottish Waters,
W72-09690 5F

PINE TREES
Moisture Content of Hummocky Sands Under Pine Plantings in the Middle Don Region (Vlazhnost'bugristykh peskov pod sosnovymi nasazhdeniyami na srednem Donu),
W72-09749 2G

PISCICIDAL ACTIVITY
Studies on a Piscicidal Constituent of Hura crepitans: I. Isolation and Characterization of Huratoxin and its Piscicidal Activity,
W72-09779 5C

PLACER DEPOSITS
New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

PLACER MINING
New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

PLANKTON
Characterization of Phosphorus-Limited Plankton Algae,
W72-09163 5C

Bioluminescence and Primary Productivity in Marine Estuarine Environments,
W72-09575 5C

PLANNING
Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

The Master Plan, Town of Poestenkill, N.Y., Volume 2.
W72-09300 6D

A Master Sewerage Plan for Burlington County, New Jersey.
W72-09303 6D

A Water Planning Concept for the State of Washington.
W72-09308 6D

Water and Land Resources, Ouachita River Basin in Arkansas,
W72-09309 6D

President's Message--Environmental Protection,
W72-09460 6E

Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

The Westwide Water Study,
W72-09701 6B

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

PLANT CELLS
Water Movement in a Plant Cell on Application of Hydrostatic Pressure,
W72-09786 2I

PLANT GROWTH
The Responses of Molinia Caerulea and Erica tetralix to Soil Aeration and Related Factors. III. Effects of Different Gas Concentrations on Growth in Solution Culture; and General Conclusions,
W72-09572 2I

PLANT PHYSIOLOGY
Advancing Frontiers of Plant Sciences, Vol. 27. A Whole-System Approach to Water Physiology in Plants,
W72-09523 2I

PLANT POPULATIONS
The Structure of the Species Populations in the Initial Stages of Salt-Marsh Succession,
W72-09288 4A

PLANT PRODUCTIVITY
Model of Plant Productivity at Limited Water Supply Considering Adaptation,
W72-09782 2I

PLASTIC TUBING
Region 7 Launches Program to reduce Subsurface Drain Costs,
W72-09697 4A

PLASTICS
Multi-Stage Plastic Media Treatment Plants,
W72-09598 5D

Laboratory Release Rate Studies of Dursban-Polymeric Formulations, March-July 1970,
W72-09676 5B

PLEISTOCENE RED CLAY
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

PLUTONIUM
Determination of Plutonium in Environmental Surveillance Samples,
W72-09441 5A

PNEUMATIC WAVE GENERATORS
The Approximate Theories of Pneumatic Wave Generators,
W72-09541 8B

PODZOLS
Moisture Variations in a Model Sod-Podzolic Soil (O nekotorykh zakonomernostyakh var-'irovaniya vlazhnosti v model'noy dernovo-podzolistoy pochve),
W72-09748 2G

POESTENKILL
The Master Plan, Town of Poestenkill, N.Y., Volume 2.
W72-09300 6D

POINSETT COUNTY (ARK)
Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

POISSON DISTRIBUTION
All Count Distributions are not Alike,
W72-09339 7B

POLAND
Potential Uses of Waste Waters and Heated Effluents,
W72-09733 5B

POLAR GLACIERS
Glaciers and Geological Evolution of the Earth (Oledeneniya i geologicheskoye razvitiye zemli),
W72-09279 2C

POLAROGRAPHIC ANALYSIS
Polarography of Seawater II. Complex Formation of Cadmium with EDTA,
W72-09673 5A

POLISHING
Chemical-Physical Wastewater Treatment Phase 2: Activated Carbon Adsorption and Polishing,
W72-09302 5D

POLITICAL ASPECTS
Pollution Prices in a General Equilibrium Model,
W72-09235 5G

Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

POLITICAL CONSTRAINTS
Closing Circle on Environmental Economics,
W72-09144 6E

POLLUTANT IDENTIFICATION
Optimal Search for Pollution Sources,
W72-09232 5B

Cyanide Extraction and Electrodisposition of Trace Amounts of Radioactive Silver From Large Biological Samples,
W72-09246 5A

Analysis of Explosives in Sea Water,
W72-09312 5A

Determination of Carbetamide Residues and its Aniline Metabolite,
W72-09316 5A

Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

POLLUTANTS
Pollution Prices in a General Equilibrium Model,
W72-09235 5G

Pollutants and Food-Chains,
W72-09402 5C

POLLUTION
Pollution Prices in a General Equilibrium Model,
W72-09235 5G

POLLUTION ABATEMENT
Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

Capital and Operating Costs--AWT,
W72-09140 5D

Closing Circle on Environmental Economics,
W72-09144 6E

The Economist's Approach to Pollution and Its Control,
W72-09145 6C

Economic Information for Environmental Quality Management,
W72-09147 6G

A Statutory Analysis of Florida's Water Pollution Control Legislation,
W72-09479 6E

POLLUTION PRICES
Pollution Prices in a General Equilibrium Model,
W72-09235 5G

POLLUTION TAXES (CHARGES)
Pollution: Cleaning up Costs Money,
W72-09461 5G

POLYAMIDES
Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

POLYCHLORINATED BIPHENYLS
Micro Scale Alkali Treatment for use in Pesticide Residue Confirmation and Sample Cleanup,
W72-09314 5A

Column Extraction of Pesticides from Fish, Fish Food and Mud,
W72-09315 5A

Oceans as Alphabet Soup: Focus on DDT and PCB's,
W72-09409 5B

Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

POLYELECTROLYTES
Flocculation of Particles Dispersed in Aqueous Media and Flocculants Used Therein,
W72-09505 5D

The Application to Existing Plant of Recent Developments in Water Filtration,
W72-09689 5F

POLYETHYLENE
Region 7 Launches Program to reduce Subsurface Drain Costs,
W72-09697 4A

POLYMER CONCRETES
New Techniques for Quality Control of Concrete,
W72-09712 8F

POLYMER SYNTHESIS
Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

POLYMERS
Flocculation of Particles Dispersed in Aqueous Media and Flocculants Used Therein,
W72-09505 5D

POLYPHOSPHONYL UREAS
Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

POLYSULFONAMIDES
Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

PONDS
Hazelwood Power Station - Data Collection and Analysis of Cooling Pond Performance,
W72-09737 5D

POPULATION
The Interrelation of Carbon and Phosphorus in Regulating Heterotrophic and Autotrophic Populations in an Aquatic Ecosystem, Shriner's Pond,
W72-09159 5C

The Mangrove Swamp and Salt Marsh Communities of the Sydney District. IV. The Significance of Species Interaction,
W72-09286 2L

Environmental Control of the Abundance and Distribution of the Chydorid Cladocera,
W72-09458 2H

POPULATION STRUCTURE
A New Species of Troglobitic Asellid From Illinois,
W72-09520 5C

POTASSIUM
The Distribution of Cesium, Rubidium, and Potassium in the Quasi-Marine Ecosystem of the Salton Sea,
W72-09574 5B

POTOMAC ESTUARY
Nutrient Management in the Potomac Estuary,
W72-09171 5C

POWER CONSUMPTION
Electrically Induced Coagulation of Lignin from Kraft Mill Wastewaters,
W72-09597 5D

POWER OPERATION AND MAINTENANCE
Experience in the Operation of the Bratsk Hydroelectric Plant,
W72-09703 8C

POWER PLANTS
Method and Apparatus for Withdrawing Heat from Industrial Plants, Especially Power Plants,
W72-09489 5D

POWER TRANSFORMERS
Portable Surge Counters Check Phase-to-Phase Surge Levels Between 115-KV Power Transformer Bushings at Blue Mesa Powerplant--Colorado River Storage Project,
W72-09187 8C

POWERPLANTS
Power Plant Siting, Performance, and Economics with Dry Cooling Tower Systems,
W72-09741 5D

PRECIPITATION
Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

PRECIPITATION (ATMOSPHERIC)
Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

Environmental Radioactivity in New Zealand. Quarterly Report, Oct.-Dec. 1970.
W72-09429 5A

Rapid Evaluation of Radioactive Samples by Gamma-Ray Spectrometry,
W72-09446 5A

Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

Atmospheric Precipitation in the Armenian SSR (Atmosfernyye osadki v Armyanskoy SSR),
W72-09746 2B

Long-Term Cyclic Fluctuations of Atmospheric Precipitation in the USSR (Mnogoletniye tsiklicheskiye kolebaniya atmosfernykh osadkov na territorii SSSR),
W72-09747 2B

Catalogue of Meteorological Data of the Snowy Mountains Region, Australia.
W72-09771 7C

PRECIPITATION INTENSITY
Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

Atmospheric Precipitation in the Armenian SSR (Atmosfernyye osadki v Armyanskoy SSR),
W72-09746 2B

PRECOAT FILTRATION
Filtration of Water and Wastewater,
W72-09393 5D

PREDATION
Interspecies Conflict in Estuarine Copepods,
W72-09231 2L

PREPACKED CONCRETE
Grouting Preplaced Aggregate to Form Concrete,
W72-09190 8F

PRESSURE
The Morphlogy and Physical Properties of Pressure Ridges: Barrow, Alaska, April 1969,
W72-09639 2C

The Structure of an Ice Ridge in the Baltic,
W72-09640 2C

PRESSURE RIDGES (SEA ICE)
The Morphlogy and Physical Properties of Pressure Ridges: Barrow, Alaska, April 1969,
W72-09639 2C

PRESTRESSED CONCRETE
Seismic Resistance of Prestressed Concrete Beam-Column Assemblies,
W72-09713 8F

PRICES
Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

PRIMARY PRODUCTIVITY
Species and Individual Productivity in Phytoplankton Communities,
W72-09239 5C

A Direct Method of Measuring Benthic Primary Production in Streams,
W72-09405 5A

Bioluminescence and Primary Productivity in Marine Estuarine Environments,
W72-09575 5C

Possible Effects of Organochlorine Pesticides on Primary Productivity and Skeletogenesis of New England Estuarine and Coastal Marine Algae,
W72-09653 5C

PRODUCTION
Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

PRODUCTIVITY
The Role of Minor Nutrients in Limiting the Productivity of Aquatic Ecosystems,
W72-09158 5C

Bacterial Populations as Components of Oceanic Ecosystems,
W72-09351 5B

Relationship between the Productivity of Marine Mollusks and Their Life-Span,
W72-09569 5C

PROFILES
Beach Water Table and Beach-Profile Measuring Equipment,
W72-09758 7B

PROFIT
Closing Circle on Environmental Economics,
W72-09144 6E

PROJECT PLANNING
Willard, Kentucky. Partial Flood Protection Plan, Dry Fork of Little Fork of Little Sandy River (Final Environmental Impact Statement).
W72-09464 8D

Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

PROJECTS
The Rhode Island Water Resources Research Program, Seventh Annual Report.
W72-09200 9D

PROVENANCE
Distributional Trends in the Recent Marine Sediments of Northern Baffin Bay,
W72-09763 2L

PSEUDOMONAS
A Composite Arginine Glucose Medium for the Characterization of Pseudomonas Aeruginosa and Other Gram Negative Bacilli,
W72-09320 5C

Mechanism of the Initial Events in the Sorption of Marine Bacteria to Surfaces,
W72-09568 5C

PSEUDOMONAS AERUGINOSA
Effect of a Hostile Environment on Pseudomonas aeruginosa,
W72-09244 5C

PUBLIC CHOICE THEORY
Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

PUBLIC FUNDS
Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

PUBLIC GOODS
Externalities and Public Goods,
W72-09143 6A

Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

PUBLIC HEALTH
Investigation and Measurement of Radium in Ramsar Mineral Water,
W72-09266 5B

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 15-16,
W72-09435 8A

Rapid Methods for Measuring Raidoactivity in the Environment.
W72-09437 5A

Rapid Methods for Radioactive Environmental Monitoring in the Federal Republic of Germany, (Schnellmethoden Zur Uberwachung Der Radioaktivitat in Der Bundesrepublik Deutschland),
W72-09456 5A

Electric Power and the Environment.
W72-09529 6G

Summer Conference of Society for Applied Bacteriology, Liverpool, 13-15 July 1971,
W72-09675 5C

A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

Mycobacteria of Sewage Water and Sediment, (In French),
W72-09777 5A

PUBLIC REGULATION
Public Regulation of Water Quality in the United States,
W72-09527 5G

PUBLIC RIGHTS
Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

PUBLIC TRUST DOCTRINE
A Statutory Analysis of Florida's Water Pollution Control Legislation,
W72-09479 6E

PUBLICATIONS
Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

PUERTO RICO
Electrical Analog Model Study of Water in Guayama Area, Puerto Rico: Phase 1 -- Assembling Data for the Analog Model,
W72-09543 2F

PULP AND PAPER INDUSTRY
MBF Pilot Plant Filtration of Combined Municipal and Paper Mill Waste,
W72-09301 5D

Chemical-Physical Wastewater Treatment Phase 2: Activated Carbon Adsorption and Polishing,
W72-09302 5D

The Use of Sewage Effluent at South African Pulp and Paper Industries' Enstra Bleached Kraft Mill,
W72-09399 5D

PULP WASTES
Flocculation of Particles Dispersed in Aqueous Media and Flocculants Used Therein,
W72-09505 5D

The Clarification of Paper Mill Effluents by Activated Carbon Produced from Waste Sulfite Liquor and Other Refuse,
W72-09589 5D

The Characteristics of Residues in Spent Chlorination Liquor,
W72-09592 5D

Electrically Induced Coagulation of Lignin from Kraft Mill Wastewaters,
W72-09597 5D

PUMP TURBINES
Optimizing Hydraulic Turbine and Pump/Turbine Design,
W72-09710 8C

PUMPING PLANTS
Manson Unit, Chelan Division, Chief Joseph Dam Project, Washington (Final Environmental Impact Statement).
W72-09473 8C

Dyersburg, Tennessee (Draft Environmental Impact Statement).
W72-09480 8D

PYGOSPIO ELEGANS
Notes on the Biology of Pygospio Elegans from Maine,
W72-09685 5C

QUAHOGS
Data on Samples for Surf Clams and Ocean Quahogs,
W72-09521 7C

QUALITY CONTROL
Repeatability and Reproducibility,
W72-09310 7C

On the use of Tolerance Intervals in Acceptance Sampling by Attributes,
W72-09311 7C

Best Linear Unbiased Estimates of the Parameters of the Logistic Distribution Based on Selected Order Statistics,
W72-09348 7C

An Analysis of Variance for Categorical Data,
W72-09357 7C

On Bias Reduction in Estimation,
W72-09358 7C

New Techniques for Quality Control of Concrete,
W72-09712 8F

QUANTITATIVE ANALYSIS
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

QUAY COUNTY (N MEX)
Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

RADIATION
Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

RADIATION DOSE RATE
The Effects of Cobalt-60 Radiation on Textile Processing Waste,
W72-09391 5D

RADIOACTIVE AGE DETERMINATION
Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

RADIOACTIVE DATING
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

RADIOACTIVE WASTES
Plan for the Management of AEC-Generated Radioactive Wastes,
W72-09424 5G

Recreational Use of the Columbia River: Evaluation of Environmental Exposure,
W72-09426 6B

Rapid Methods for Specific Radionuclide Analysis and their Application to Aquatic Emergency Conditions,
W72-09457 5A

Present Status of the U.S. Program on the Solidification of High Level Wastes,
W72-09584 5D

Polarography of Seawater II. Complex Formation of Cadmium with EDTA,
W72-09673 5A

RADIOACTIVITY
Rapid Determination of Some Transuranium Elements in Biological Material by Liquid Scintillation Counting,
W72-09354 5A

Measurement of Alpha Particle Radioactivity of Water.
W72-09421 5A

Standard Method of Test for Radionuclides of Radium in Water.
W72-09422 5A

Standard Method of Test for Radioactive Cesium in Water.
W72-09423 5A

Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

Rapid Methods for Measuring Raidoactivity in the Environment.
W72-09437 5A

The Nuclear Power Industry's Need for Rapid and Accurate Estimation of Radioactivity in the Environment,
W72-09438 5A

Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

Monitoring of Tritium Under Emergency Conditions,
W72-09443 5A

Rapid Determination of Gamma-Ray Emitting Radionuclides in Water (Schnelle Bestimmung Gammastrahlender Radionuklide in Wassern),
W72-09445 5A

Rapid Evaluation of Radioactive Samples by Gamma-Ray Spectrometry,
W72-09446 5A

Role of Low-Background Beta-Ray Spectrometers for Rapid Assay of Environmental Samples,
W72-09447 5A

Determination of Environmental Radioactivity by Liquid-Scintillation Spectrometry,
W72-09448 5A

Measurements of 89Sr and 90Sr in Environmental Samples by a Low-Background Beta-Ray Spectrometer,
W72-09450 5A

A Quick and Convenient Measurement Method for Surface and Liquid Contamination Using the TLD System,
W72-09451 5A

Radioactive and Metallic (Copper and Zinc) Pollutants in the Scheldt Estuary (in Water, Sediment and Suspended Matter), (Les Polluants Radioactifs et Metalliques (Cuivre et Zinc) dans L'Estuaire De L'Escaut (Eaux, Sediments et Matieres en Suspension)),
W72-09455 5A

Electric Power and the Environment.
W72-09529 6G

Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

Decontamination of Radioactive Aqueous Effluent by the Calcium-Ferric Phosphate Process,
W72-09692 5F

RADIOACTIVITY EFFECTS

Electric Power and the Environment.
W72-09529 6G

Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

Columbia River Studies, Annual Progress Report 1970-1971,
W72-09670 5C

RADIOACTIVITY TECHNIQUES

Improved Continuous Radio Gas Chromatography of Hydrogen-3-- and Carbon-14--Labelled Compounds Using Hydrocracking,
W72-09352 5A

RADIOCARBON DATING

Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

RADIOCHEMICAL ANALYSIS

Rapid Determination of Some Transuranium Elements in Biological Material by Liquid Scintillation Counting,
W72-09354 5A

Monitoring of Tritium Under Emergency Conditions,
W72-09443 5A

RADIOISOTOPES

Cyanide Extraction and Electrodisposition of Trace Amounts of Radioactive Silver From Large Biological Samples,
W72-09246 5A

Natural Isotopes in the Groundwater of the Tulum Valley, San Juan, Argentina,
W72-09276 2F

The Toluene Extraction of Some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part 1. Extraction Behaviour of As, Au, Bi, Br, Cd, Cu, Ga, Ge, In, Hg, Mo, Pb, Sb, Se, Sn, W and Zn,
W72-09367 5A

Rapid Identification and Determination of Alpha Emitters in Environmental Samples,
W72-09442 5A

Determination of Environmental Radioactivity by Liquid-Scintillation Spectrometry,
W72-09448 5A

Measurements of 89Sr and 90Sr in Environmental Samples by a Low-Background Beta-Ray Spectrometer,
W72-09450 5A

Self-Diffusion of Trace Concentrations of Ce-144, Pm-147, and Eu-155 in Water Solutions,
W72-09530 5B

Columbia River Studies, Annual Progress Report 1970-1971,
W72-09670 5C

RADIUM

Standard Method of Test for Radionuclides of Radium in Water.
W72-09422 5A

Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

RADIUM RADIOISOTOPES

Investigation and Measurement of Radium in Ramsar Mineral Water,
W72-09266 5B

RADON

Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

RAIN FORESTS

An Analysis of Four Tropical Rain Forest Sites in New Guinea,
W72-09576 2I

RAINBOW TROUT

Possible DDT Mortality in Young Rainbow Trout,
W72-09141 5C

RAINDDROPS

Submicroscopic Aerosols from Electrically Stressed Water Surfaces,
W72-09214 2B

RAINDROP BREAKUP

Experiments on the Generation of Raindrop-Size Distributions by Drop Breakup,
W72-09203 2B

RAINDROP INTERACTION

Large Vertical Wind Tunnel for Hydrometeor Studies,
W72-09210 2B

RAINDROPS

Structure and Modification of Clouds and Fogs,
W72-09201 2B

Experiments on the Generation of Raindrop-Size Distributions by Drop Breakup,
W72-09203 2B

Experimental Studies of Freezing, Wake Effect, and Breakup of Freely Suspended Supercooled Water Drops,
W72-09204 2B

Large Vertical Wind Tunnel for Hydrometeor Studies,
W72-09210 2B

Design, Construction and Testing of the Dropsonde,
W72-09211 2B

Charging of Droplets by Impulse Corona,
W72-09212 2B

Field-Enhanced Propagation of Positive Streamers and Implications to Electrically Influenced Droplet Coalescence,
W72-09213 2B

Effect of Electric Field on Charge Separation by the Falling Precipitation Mechanism in Thunderclouds,
W72-09215 2B

RAINFALL

Some Economic Aspects of Rain Stimulation,
W72-09146 3B

Structure and Modification of Clouds and Fogs,
W72-09201 2B

Experiments on the Generation of Raindrop-Size Distributions by Drop Breakup,
W72-09203 2B

Charging of Droplets by Impulse Corona,
W72-09212 2B

Field-Enhanced Propagation of Positive Streamers and Implications to Electrically Influenced Droplet Coalescence,
W72-09213 2B

Effect of Electric Field on Charge Separation by the Falling Precipitation Mechanism in Thunderclouds,
W72-09215 2B

Effect of Elevation and Rainfall on the Physicochemical Properties of the Soils of the High Ranges of Kerala,
W72-09774 2G

RAINFALL DISPOSITION
Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

Atmospheric Precipitation in the Armenian SSR (Atmosfernyye osadki v Armyanskoy SSR),
W72-09746 2B

RAINFALL SIMULATORS
Large Vertical Wind Tunnel for Hydrometeor Studies,
W72-09210 2B

RAINFALL STIMULATION
Some Economic Aspects of Rain Stimulation,
W72-09146 3B

RAPID MEASUREMENT
Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

RDX
Analysis of Explosives in Sea Water,
W72-09312 5A

REACTION RATE
Effect of Porous Structure on Carbon Activation.
W72-09581 5D

REACTION RATES
Biological Factors in Aerator Performance,
W72-09602 5D

RECYCLING
Controlled Eutrophication-Increasing Food Production from the Sea by Recycling Human Wastes,
W72-09378 5G

RED TIDE
Prediction of the Florida Red Tide by Means of the Iron Index; Red Tide, Iron and Humic Acid Levels in Streams.
W72-09524 5B

REED M
Elution of Mineral Components Out of Dead Reed Phragmites communis Trin,
W72-09778 2H

REGENERATION
Wastewater Ammonia Removal by Ion Exchange.
W72-09383 5D

Notes on the Biology of Pygospio Elegans from Maine,
W72-09685 5C

REGIONAL ANALYSIS
Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

REGIONAL ECONOMICS
Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

REGIONAL INSTITUTIONS
Public Regulation of Water Quality in the United States,
W72-09527 5G

REGRESSION ANALYSIS
Physical and Biotic Factors Affecting Euxoa Species Abundance in Western North America: A Regression Analysis,
W72-09414 2I

REGULATED FLOW
A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

REGULATION
Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

REINFORCED CONCRETE
Tensile Tests of Ferrocement,
W72-09709 8F

REMEDIES
International and National Approaches to Oil Pollution Responsibility: An Emerging Regime for a Global Problem,
W72-09467 5G

REMOTE SENSING
Remote Sensing Acquisition of Tracer Dye and Infrared Imagery Information and Interpretation for Industrial Discharge Management,
W72-09550 5B

Methods for Evaluating Effects of Transient Conditions in Heavily Loaded and Extensively Regulated Streams,
W72-09731 5B

REPEATABILITY
Repeatability and Reproducibility,
W72-09310 7C

REPRODUCIBILITY
Repeatability and Reproducibility,
W72-09310 7C

REPRODUCTION
Notes on the Biology of Pygospio Elegans from Maine,
W72-09685 5C

RESEARCH PLANNING
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

RESEARCH WATERSHEDS
Chaparral Treatment Effects on Streamflow,
W72-09604 3B

RESERVOIRS
Selective Withdrawal Studies for the Fish Hatchery Outlets at Pueblo Dam--Mathematical and Physical Models,
W72-09194 8B

Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

A Comparison of Mass-Transfer and Climatic-Index Evaporation Computations from Small Reservoirs in Texas,
W72-09555 2H

Mathematical Models for the Prediction of Thermal Energy Changes in Impoundments.
W72-09727 5B

RESIDUAL STRENGTH
A New Ring Shear Apparatus and its Application to the Measurement of Residual Strength,
W72-09706 8D

RESIDUALS
Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

RESISTANCE
Insidious Alteration of the Estuarine Environment,
W72-09717 5C

Upper Temperature Tolerances of Some Estuarine Bivalves,
W72-09734 5C

Changed Resistance of Aspen Mesophyll as a Response to Rapid Leaf Drying, (In Russian),
W72-09775 2D

RESONANCE
Comparison of Computed and Measured Dynamic Response of Monticello Dam,
W72-09198 8A

Study of Crude Oil and Some of its High Molecular Compounds Using Electron Paramagnetic Resonance (Review),
W72-09404 5A

RESOURCE ALLOCATION
Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

RESPIRATION
Light-Induced Inhibition of Respiration in DCMU-Poisoned Chlorella by Photosystem I Activity,
W72-09178 5C

Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in

RESPIRATION

Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

Development and Use of a Large-Volume Automatic Respirometer,
W72-09396 5D

A Direct Method of Measuring Benthic Primary Production in Streams,
W72-09405 5A

Methods for Clean Condensation of Atmospheric Moisture for Its Use in a Closed Ecological System,
W72-09583 5D

RETURN FLOW

Annotated Bibliography of Publications on Watershed Management by the Southeastern Forest Experiment Station, 1928-1970,
W72-09603 3B

RETURN SLUDGE CONCENTRATION

A Mathematical Model of a Final Clarifier.
W72-09382 5D

REVERSE OSMOSIS

Evaporation-Reverse Osmosis Water Desalination System,
W72-09506 3A

Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

Development of Cellulose Triacetate Hollow Fiber Reverse Osmosis Modules for Brackish Water Desalination,
W72-09517 3A

Evaluation of Single and Multiple Pass Seawater Desalination.
W72-09518 3A

REVIEWS

Waste Treatment Lagoons-State of the Art.
W72-09386 5D

Study of Crude Oil and Some of its High Molecular Compounds Using Electron Paramagnetic Resonance (Review),
W72-09404 5A

Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

RHINE RIVER

Ice Cover Formation and Associated Hydro-Dynamic Effects in the Lower Part of the River Rhine,
W72-09634 2C

RHODE ISLAND

The Rhode Island Water Resources Research Program, Seventh Annual Report.
W72-09200 9D

RICE

Response of Rice to Phosphate Manuring in a Waterlogged Lateritic Sandy Loam of Kerala,
W72-09578 3F

RIME

Rime Contributes to Water Balance in High-Elevation Aspen Forests,
W72-09613 2C

RING SHEAR TESTS

A New Ring Shear Apparatus and its Application to the Measurement of Residual Strength,
W72-09706 8D

RIO GRANDE RIVER BASIN

A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

RIPARIAN WATER LOSS

Chaparral Treatment Effects on Streamflow,
W72-09604 3B

RIPPLE MARKS

Initiation of Ripples by Artificial Disturbances,
W72-09260 2J

RIPRAP

Selection of Scale for Riprap Model of In-Shore Harbor, Site X. Analytical Investigation,
W72-09615 8B

RISKS

Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

RITZVILLE-ODESSA (WASH)

Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

RIVER BASINS

A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

RIVER ICE

The Iowa Low Temperature Flow Facility,
W72-09627 2C

RIVER SEDIMENTS

DDT Residues in Salinas River Sediments,
W72-09313 5B

RIVERS

The Nation's Rivers,
W72-09188 5G

Aeration Systems for Large Navigable Rivers,
W72-09196 5G

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

Ice Monitoring Equipment,
W72-09626 2C

Flow Measurements of Ice-Covered Rivers in Hokkaido,
W72-09628 2C

Calculation of Frazil Ice Production,
W72-09629 2C

Temperature and Flow Conditions During the Formation of River Ice,
W72-09631 2C

Investigations into Frazil, Bottom Ice and Surface Ice Formation in the Niagara River,
W72-09632 2C

Heat Exchanges and Frazil Formation,
W72-09633 2C

Ice Cover Formation and Associated Hydro-Dynamic Effects in the Lower Part of the River Rhine,
W72-09634 2C

A Study on the Formation of the River Ice in a Snow Area,
W72-09637 2C

Break-Up and Control of River Ice,
W72-09642 2C

ROLLING FORK RIVER (ARK.)

Dequeen Lake, Rolling Fork River, Arkansas (Draft Environmental Impact Statement).
W72-09462 8D

ROME

The Fountains of Rome,
W72-09380 8A

ROOSEVELT COUNTY (N MEX)

Land Classification for Irrigation, Roosevelt County,
W72-09663 3F

ROUGHNESS (HYDRAULIC)

Measurements of Ice Roughness and the Effect of Ice Cover on Water Levels in Three Norwegian Rivers,
W72-09638 2C

RUBIDIUM

The Distribution of Cesium, Rubidium, and Potassium in the Quasi-Marine Ecosystem of the Salton Sea,
W72-09574 5B

RUNOFF

Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

Hydro-Physiographic Model,
W72-09234 6A

RUNOFF FORECASTING

Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

RURAL SOCIOLOGY

The Master Plan, Town of Poestenkill, N.Y., Volume 2.
W72-09300 6D

RUTHENIUM
Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

SACCHARIDES
Analysis of Small Quantities of Saccharides in Aqueous Effluents,
W72-09419 5A

SAFE YIELD
Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

SAFETY
Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 15-16,
W72-09435 8A

SALINE SOILS
Effects of Irrigation on Salt Regime of Dark-Chestnut Terrace Soils in the Transvolga Region (Vliyaniye orosheniya na solevoy rezhim terrasovykh temno-kashtanovykh pochv Zavolzh'ya),
W72-09751 3F

SALINE WATER
A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

SALINE WATER INTRUSION
Groundwater Flow in Calcareous Aquifers in the Vicinity of Barcelona, Spain,
W72-09277 2F

Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

SALINITY
Fallout Cesium-137 in Clams (Rangia Cuneata) From the Neuse River Estuary, North Carolina,
W72-09337 5A

Catches of Postlarval White Shrimp, 'Penaeus setiferus' (Linn.), and Brown Shrimp, P. aztecus ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967,
W72-09674 2L

Groundwater and Drainage-Water Mineralization in the Mugan-sal'yany Region (Mineralizatsiya gruntovykh i drenazhnykh vod Mugano-Sal'yanskogo massiva),
W72-09750 4B

SALMONELLA
Comparison of Methods of Estimating the Number of Escherichia coli in Edible Mussels and the Relationship between the Presence of Salmonellae and E. coli,
W72-09319 5A

Effects of Incubation Temperature on the Salt Tolerance of Salmonella,
W72-09371 5C

SALT
The Structure of the Species Populations in the Initial Stages of Salt-Marsh Succession,
W72-09288 4A

SALT CREEK (NEBR)
Characteristics of Streamflow at Gaging Stations in Shell Creek, Elkhorn River, and Salt Creek Basins, Nebraska,
W72-09556 2E

SALT MARSHES
The Mangrove Swamp and Salt Marsh Communities of the Sydney District. IV. The Significance of Species Interaction,
W72-09286 2L

SALT TOLERANCE
Effects of Incubation Temperature on the Salt Tolerance of Salmonella,
W72-09371 5C

SALTON SEA
The Distribution of Cesium, Rubidium, and Potassium in the Quasi-Marine Ecosystem of the Salton Sea,
W72-09574 5B

SALTS
The Role of the Diffuse Layer in Water-In-Oil Microemulsions,
W72-09335 5A

Organic Radical-Ion Salts as Selective Electrochemical Sensors,
W72-09366 5A

Ion Association and the Analysis of Precise Conductimetric Data,
W72-09544 2K

Groundwater and Drainage-Water Mineralization in the Mugan-sal'yany Region (Mineralizatsiya gruntovykh i drenazhnykh vod Mugano-Sal'yanskogo massiva),
W72-09750 4B

SAMPLING
On the use of Tolerance Intervals in Acceptance Sampling by Attributes,
W72-09311 7C

A Practical On-Stream Particle Size Analysis System,
W72-09372 7B

Water Pollution Monitoring Stations: An Ounce of Prevention,
W72-09374 5A

The Statistics of Subsampling,
W72-09416 7B

Determination of Plutonium in Environmental Surveillance Samples,
W72-09441 5A

A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

Rapid Evaluation of Radioactive Samples by Gamma-Ray Spectrometry,
W72-09446 5A

Experimental Study of the Fouling Process at Sea,
W72-09564 5A

Emergence Trap Collections of Trichoptera from an Oregon Stream,
W72-09571 5A

Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

Getting Representative Water Samples,
W72-09672 5A

SAN ANGELO (TEX)
The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

SAND WAVES
Initiation of Ripples by Artificial Disturbances,
W72-09260 2J

Selection of Scale for Riprap Model of In-Shore Harbor, Site X. Analytical Investigation,
W72-09615 8B

SANDOVAL COUNTY (NMEX)
Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

SANDS
Adsorption of Lindane and Dieldrin Pesticides on Unconsolidated Aquifer Sands,
W72-09539 5B

Moisture Content of Hummocky Sands Under Pine Plantings in the Middle Don Region (Vlazhnost'bugristykh peskov pod sosnovymi nasazhdeniyami na srednem Donu),
W72-09749 2G

SANITARY ENGINEERING
Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

SANTA BARBARA (CALIF)
The Santa Barbara Oil Spill Part 1: Initial Quantities and Distribution of Pollutant Crude Oil,
W72-09682 5B

The Santa Barbara Oil Spill Part 2: Initial Effects on Intertidal and Kelp Bed Organisms,
W72-09683 5C

SATURATED SOILS
Resistance of Soil to Liquefaction and Settlement,
W72-09704 8D

SCHELDT ESTUARY
Radioactive and Metallic (Copper and Zinc) Pollutants in the Scheldt Estuary (in Water, Sediment and Suspended Matter), (Les Polluants Radioactifs et Metalliques (Cuivre et Zinc) dans L'Estuaire De L'Escaut (Eaux, Sediments et Matieres en Suspension)),
W72-09455 5A

SCINTILLATION COUNTING
Rapid Determination of Some Transuranium Elements in Biological Material by Liquid Scintillation Counting,
W72-09354 5A

SCUM
The Effects of Oil on Sewers and Treatment Plants,
W72-09395 5D

SEA GRASS M
The Water Economy of the Sea Grass Thalassia testudinum,
W72-09784 2L

SEA ICE
The Morphlogy and Physical Properties of Pressure Ridges: Barrow, Alaska, April 1969,
W72-09639 2C

SEA ICE

The Structure of an Ice Ridge in the Baltic,
W72-09640 2C

SEA LEVEL

On the Classification and Trends of Long Period Sea Level Series,
W72-09757 7C

SEA SPRAY

Salt Spray and Mineral Cycling in Two California Coastal Ecosystems,
W72-09605 2K

SEA URCHINS

Effects of Petroleum Fractions on the Early Development of a Sea Urchin,
W72-09677 5C

SEA WATER

Arsenate in the Western North Atlantic and Adjacent Regions,
W72-09249 5A

Analysis of Explosives in Sea Water,
W72-09312 5A

Determination of Nanomolar Quantities of Free Amino Acids Dissolved in North Atlantic Ocean Waters,
W72-09343 5A

Voltammetric Measurement of Zinc in the Northeastern Tropical Pacific Ocean,
W72-09413 5A

Experimental Study of the Fouling Process at Sea,
W72-09564 5A

Polarography of Seawater II. Complex Formation of Cadmium with EDTA,
W72-09673 5A

SEA WATER ECONOMICS

Evaluation of Single and Multiple Pass Seawater Desalination.
W72-09518 3A

SEAFOOD TAINTING

Kerosene-Like Tainting in Australian Mullet,
W72-09678 5C

SEASONAL

Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

SEATTLE (WASH)

How Seattle Beat Pollution,
W72-09179 5C

SEBASTOPOL GULF

Experimental Study of the Fouling Process at Sea,
W72-09564 5A

SEDIMENT CONTROL

Proceedings - Workshop on Sediment Control.
W72-09656 4D

SEDIMENT DISTRIBUTION

Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

A Guide to the Geology of Delaware's Coastal Environments,
W72-09614 2J

SEDIMENT TRANSPORT

Initiation of Ripples by Artificial Disturbances,
W72-09260 2J

An Inventory of Published and Unpublished Fluvial-Sediment Data for California, 1956-70,
W72-09542 2J

Studies of Sediment Transport in the Columbia River Estuary,
W72-09551 5B

Distributional Trends in the Recent Marine Sediments of Northern Baffin Bay,
W72-09763 2L

SEDIMENT YIELD

An Inventory of Published and Unpublished Fluvial-Sediment Data for California, 1956-70,
W72-09542 2J

Reconnaissance Study of Sediment Transported by Streams, Island of Oahu,
W72-09759 2J

SEDIMENTARY STRUCTURES

Sedimentary Structures Formed by Flash Floods in Southern Israel,
W72-09540 2J

SEDIMENTATION

History of the World's Oceans (Istoriya Mirovogo okeana).
W72-09282 2L

New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

Reconnaissance Study of Sediment Transported by Streams, Island of Oahu,
W72-09759 2J

Distributional Trends in the Recent Marine Sediments of Northern Baffin Bay,
W72-09763 2L

SEDIMENTATION RATES

A Mathematical Model of a Final Clarifier.
W72-09382 5D

SEDIMENTS

Animal-Sediment Relations and Community Analysis of a Florida Estuary,
W72-09177 5C

History of the World's Oceans (Istoriya Mirovogo okeana).
W72-09282 2L

Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

Distribution of Certain Heterotrophic Aerobic Bacteria in Eastern Mediterranean Deep-Sea Sediments, (Distribution De Certaines Bacteries Heterotrophes Aerobied Dans Les Sediments Profonds De Mediterranee Orientale),
W72-09349 5C

The Seasonal Selection by Temperature of Heterotrophic Bacteria in an Intertidal Sediment,
W72-09350 5C

Nitrogen Fixation by Bacteria in Lake Mize, Florida, and in Some Lacustrine Sediments,
W72-09579 5C

SEEPAGE

Two- and Three-Dimensional Infiltration: Seepage From Irrigation Channels and Infiltrometer Rings,
W72-09270 4A

SEISMIC DESIGN

Comparison of Computed and Measured Dynamic Response of Monticello Dam,
W72-09198 8A

SEISMIC STUDIES

Determination of the Zone of Origin of Tsunamis (Opredeleniye mesta vozniknoveniya tsunami),
W72-09280 2L

SEISMIC TESTS

Seismic Resistance of Prestressed Concrete Beam-Column Assemblies,
W72-09713 8F

SEISMIC WAVES

Public Safety and Underground Nuclear Detonations,
W72-09427 5G

SELECTED ORDER STATISTICS

Best Linear Unbiased Estimates of the Parameters of the Logistic Distribution Based on Selected Order Statistics,
W72-09348 7C

SELECTIVE LEVEL RELEASES

Selective Withdrawal Studies for the Fish Hatchery Outlets at Pueblo Dam--Mathematical and Physical Models,
W72-09194 8B

SELECTIVE MEDIA

Factors Involved in the Isolation of Clostridium Perfringens,
W72-09370 5A

SELECTIVITY

Selective Hydrogenation of Soybean Oil. VI. Copper-on-Silica Gel Catalysts,
W72-09346 5A

SEMIPERMEABLE MEMBRANES

Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

SEPARATION TECHNIQUES

Determination of Copper, Iron, and Zinc From a Single Small Sample,
W72-09243 5A

Cyanide Extraction and Electrodisposition of Trace Amounts of Radioactive Silver From Large Biological Samples,
W72-09246 5A

Micro Scale Alkali Treatment for use in Pesticide Residue Confirmation and Sample Cleanup,
W72-09314 5A

Column Extraction of Pesticides from Fish, Fish Food and Mud,
W72-09315 5A

Hydrolysis and Solvent Partition of Phosdrin and Related Organophosphates,
W72-09321 5B

Determination of Nanomolar Quantities of Free Amino Acids Dissolved in North Atlantic Ocean Waters,
W72-09343 5A

A Comparison of Some Ready-For-Use Thin Layers for the Separation of Heavy Metals with Butanol-3 N HCl,
W72-09353 5A

The Toluene Extraction of Some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part 1. Extraction Behaviour of As, Au, Bi, Br, Cd, Cu, Ga, Ge, In, Hg, Mo, Pb, Sb, Se, Sn, W and Zn,
W72-09367 5A

The Analysis of Nitrogen Containing Polymeric Ashless Oil Dispersants by Dialysis and Alumina Chromatography,
W72-09376 5A

Phosphate Precipitation with Ferrous Iron,
W72-09388 5D

Separator for Nonmiscible Liquids,
W72-09509 5G

Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

SERIES CAPACITORS
Field Tests of the 345 KV Series Compensated Glen Canyon-Pinnacle Peak Transmission Lines--Colorado River Storage Project,
W72-09192 8C

SETTLING BASINS
A Mathematical Model of a Final Clarifier.
W72-09382 5D

SETTLING VELOCITY
Theory of Hail Growth,
W72-09205 2B

Estimation of the Occurrence of Hail and Hailstone Sizes,
W72-09206 2B

SEWAGE
The Determination of Nitrilotriacetic Acid (NTA) In Sewage and Sewage Effluent,
W72-09251 5A

Analysis of Small Quantities of Saccharides in Aqueous Effluents,
W72-09419 5A

Flocculation of Particles Dispersed in Aqueous Media and Flocculants Used Therein,
W72-09505 5D

Water Quality Control in Oregon.
W72-09669 5G

Summer Conference of Society for Applied Bacteriology, Liverpool, 13-15 July 1971,
W72-09675 5C

Mycobacteria of Sewage Water and Sediment, (In French),
W72-09777 5A

SEWAGE EFFLUENTS
Phosphorus in Wastewater Effluents and Algal Growth,
W72-09176 5C

The Determination of Nitrilotriacetic Acid (NTA) In Sewage and Sewage Effluent,
W72-09251 5A

Analysis of Small Quantities of Saccharides in Aqueous Effluents,
W72-09419 5A

SEWAGE LAGOONS
Carbon Limitation in Sewage Lagoons,
W72-09162 5C

Waste Treatment Lagoons-State of the Art.
W72-09386 5D

SEWAGE SLUDGE
Treatment of Sewage Digester Supernatant Liquor,
W72-09488 5D

SEWAGE TREATMENT
Treatment of Sewage Digester Supernatant Liquor,
W72-09488 5D

Biochemical Process,
W72-09502 5D

SEWERAGE
A Master Sewerage Plan for Burlington County, New Jersey.
W72-09303 6D

The Effects of Oil on Sewers and Treatment Plants,
W72-09395 5D

Testing New Sewer Pipe Installations,
W72-09595 5D

SHADOW PRICES
Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

SHEAR TESTS
A New Ring Shear Apparatus and its Application to the Measurement of Residual Strength,
W72-09706 8D

SHELL CREEK (NEBR)
Characteristics of Streamflow at Gaging Stations in Shell Creek, Elkhorn River, and Salt Creek Basins, Nebraska,
W72-09556 2E

SHELLFISH
Heavy Metals in United States Fish,
W72-09719 5B

SHELLFISH SANITATION
Heavy Metals in United States Fish,
W72-09719 5B

SHOCK LOADING
Operation of a Central Waste Treatment System-Bayport Industrial Complex,
W72-09586 5D

SHORE PROTECTION
Floating Breakwater,
W72-09511 4A

A Guide to the Geology of Delaware's Coastal Environments,
W72-09614 2J

Concrete Blocks for Earth Slope Protection,
W72-09705 4A

SHRIMP
Uptake, Assimilation, and Loss of DDT Residues by Euphausia pacifica, A Euphausid Shrimp,
W72-09519 5C

SIBERIA
Effects of Pesticides on the Life of a Water Body (K voprosu o vliyanii pestitsidov na zhizn' vodoyema),
W72-09651 5C

SIERRA NEVADA
Deuterium Content of Snow as an Index to Winter Climate in the Sierra Nevada Area,
W72-09622 2C

SILICA
Phosphorus, Silica, and Eutrophication of Lake Michigan,
W72-09166 5C

SILICATES
Use of Acid-Treated Sodium Silicate in Coagulation,
W72-09691 5F

SILVER RADIOISOTOPES
Cyanide Extraction and Electrodisposition of Trace Amounts of Radioactive Silver From Large Biological Samples,
W72-09246 5A

SIMULATION
Computer Software for Wastewater Treatment Plant Design,
W72-09233 5D

Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

SIMULATION ANALYSIS
Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

Applications of Some Numerical Models to Pacific Northwest Estuaries,
W72-09549 5B

SINGLE PASS DESALINATION
Evaluation of Single and Multiple Pass Seawater Desalination.
W72-09518 3A

SITES
Power Plant Siting, Performance, and Economics with Dry Cooling Tower Systems,
W72-09741 5D

SKIING
Take the Plunge,
W72-09612 2C

SLOPE ANGLES
Drainage from Level and Sloping Land,
W72-09698 8B

SLOPE PROTECTION
Chemical Stabilization of Soils,
W72-09191 8D

Concrete Blocks for Earth Slope Protection,
W72-09705 4A

SLOPES
Drainage from Level and Sloping Land,
W72-09698 8B

SLUDGE
Crystal Seed Conditioning of Calcium Carbonate Sludge,
W72-09392 5F

Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

Decontamination of Radioactive Aqueous Effluent by the Calcium-Ferric Phosphate Process,
W72-09692 5F

SLUDGE DIGESTION
Activated Sludge Processing.
W72-09389 5D

SLUDGE PRODUCTION
Activated Sludge Processing.
W72-09389 5D

SLUDGE QUALITY
A Mathematical Model of a Final Clarifier.
W72-09382 5D

SLUDGE TREATMENT
Decontamination of Radioactive Aqueous Effluent by the Calcium-Ferric Phosphate Process,
W72-09692 5F

SLUDGE VOLUME INDEX
Crystal Seed Conditioning of Calcium Carbonate Sludge,
W72-09392 5F

SMALL WATERSHEDS
Hydrologic Investigation of Small Watersheds in Ohio, Phase I: 1966-1969,
W72-09296 2A

SMOG
Pollution Prices in a General Equilibrium Model,
W72-09235 5G

SNAKE RIVER BASIN
A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

SNOW
The Relation of Snow Transparency to Density and Air Permeability in a Natural Snow Cover,
W72-09607 2C

The Relationship Between Density and Tensile Strength in Snow,
W72-09611 2C

A Study on the Formation of the River Ice in a Snow Area,
W72-09637 2C

SNOW MANAGEMENT
Take the Plunge,
W72-09612 2C

SNOWFALL
Deuterium Content of Snow as an Index to Winter Climate in the Sierra Nevada Area,
W72-09622 2C

SNOWPACKS
Take the Plunge,
W72-09612 2C

Rime Contributes to Water Balance in High-Elevation Aspen Forests,
W72-09613 2C

SOD-PODZOLIC SOILS
Moisture Variations in a Model Sod-Podzolic Soil (O nekotorykh zakonomernostyakh var-'irovaniya vlazhnosti v model'noy dernovo-podzolistoy pochve),
W72-09748 2G

SOIL ANALYSIS
Determination of Antimony in Geological Materials by Atomic Absorption Spectrometry,
W72-09328 5A

SOIL ASSOCIATION
Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

SOIL ASSOCIATIONS
Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

Land Classification for Irrigation, Roosevelt County,
W72-09663 3F

Land Classification for Irrigation, Torrance County,
W72-09664 3F

Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

SOIL CHEMISTRY
Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

SOIL CLASSIFICATION
Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

Land Classification for Irrigation, Roosevelt County,
W72-09663 3F

Land Classification for Irrigation, Torrance County,
W72-09664 3F

Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

SOIL CONSERVATION
Proceedings - Workshop on Sediment Control.
W72-09656 4D

SOIL CONSERVATION SERVICE
Role of the Soil Conservation Service in Design of Feedlot Waste Management Facilities,
W72-09149 5G

SOIL CONTAMINATION
The Nuclear Power Industry's Need for Rapid and Accurate Estimation of Radioactivity in the Environment,
W72-09438 5A

Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

Electric Power and the Environment.
W72-09529 6G

SOIL DENSITY
Development and Trail use of Acceptance Sampling Plans for Compacted Embankments,
W72-09700 8D

SOIL EMANATIONS
Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

SOIL EROSION
Water Erosion of Soils in the Ob' River Region Near Novosibirsk (Vodnaya eroziya pochv Novosibirskogo Priob'ya),
W72-09281 2J

Proceedings - Workshop on Sediment Control.
W72-09656 4D

Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

SOIL GASES
Soil Nitrogen Cycle--A Bibliography.
W72-09299 2G

Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

SOIL LIQUEFACTION
Resistance of Soil to Liquefaction and Settlement,
W72-09704 8D

SOIL MICROBIOLOGY
Possible Origin of Clostridium Botulinum Contamination of Eskimo Foods in Northwestern Alaska,
W72-09417 5C

SOIL MOISTURE
A Test of the Uniqueness of the Soil Moisture Characteristic During Transient, Nonhysteretic Flow of Water in a Rigid Soil,
W72-09183 2G

Estimating Soil Moisture Depletion from Climate, Crop and Soil Data,
W72-09223 2G

Moisture Variations in a Model Sod-Podzolic Soil (O nekotorykh zakonomernostyakh var-'irovaniya vlazhnosti v model'noy dernovo-podzolistoy pochve),
W72-09748 2G

Moisture Content of Hummocky Sands Under Pine Plantings in the Middle Don Region (Vlazhnost'bugristykh peskov pod sosnovymi nasazhdeniyami na srednem Donu),
W72-09749 2G

SOIL PHYSICS
Moisture Variations in a Model Sod-Podzolic Soil (O nekotorykh zakonomernostyakh var-'irovaniya vlazhnosti v model'noy dernovo-podzolistoy pochve),
W72-09748 2G

Moisture Content of Hummocky Sands Under Pine Plantings in the Middle Don Region (Vlazhnost'bugristykh peskov pod sosnovymi nasazhdeniyami na srednem Donu),
W72-09749 2G

SOIL PROPERTIES
Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

Effect of Elevation and Rainfall on the Physicochemical Properties of the Soils of the High Ranges of Kerala,
W72-09774 2G

SOIL SCIENCE
Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

SOIL STABILIZATION
Chemical Stabilization of Soils,
W72-09191 8D

Soil Stabilization: A Mission Oriented Approach,
W72-09193 8D

SOIL SURFACES
Vegetation Stripes on Sheet Wash Surfaces,
W72-09307 2I

SOIL TEMPERATURE
The Seasonal Selection by Temperature of Heterotrophic Bacteria in an Intertidal Sediment,
W72-09350 5C

SOIL TESTS
A New Ring Shear Apparatus and its Application to the Measurement of Residual Strength,
W72-09706 8D

SOIL TREATMENT
Chemical Stabilization of Soils,
W72-09191 8D

Soil Stabilization: A Mission Oriented Approach,
W72-09193 8D

SOIL WATER
Available Soil Water: Time-Distribution in a Warm Season Rangeland,
W72-09271 2A

SOIL-WATER-PLANT RELATIONSHIPS
Salt Spray and Mineral Cycling in Two California Coastal Ecosystems,
W72-09605 2K

Plant Indicators for pH and Water Level in Peatlands at Candle Lake, Saskatchewan,
W72-09730 2H

SOILS
Soil Stabilization: A Mission Oriented Approach,
W72-09193 8D

Water Erosion of Soils in the Ob' River Region Near Novosibirsk (Vodnaya eroziya pochv Novosibirskogo Priob'ya),
W72-09281 2J

The Determination of Lead and Cadmium in Soils and Leaves by Atomic Absorption Spectroscopy,
W72-09331 5A

SOLID WASTES
Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

Disposal of Solid Aluminum Process Wastes in the Ocean,
W72-09552 5C

SOLIDIFICATION
Present Status of the U.S. Program on the Solidification of High Level Wastes,
W72-09584 5D

SOLVENT PARTITIONING
Hydrolysis and Solvent Partition of Phosdrin and Related Organophosphates,
W72-09321 5B

SOLVENTS
The Effect of Chloroform in Sewage on the Production of Gas From Laboratory Digesters,
W72-09398 5D

SORPTION
Mechanism of the Initial Events in the Sorption of Marine Bacteria to Surfaces,
W72-09568 5C

SOUTH ATLANTIC SLOPE BASINS
Index of Surface-Water Records to September 30, 1970: Part 2.--South Atlantic Slope and Eastern Gulf of Mexico Basins.
W72-09224 2E

SOUTH CHINA SEA
Selection of Scale for Riprap Model of In-Shore Harbor, Site X. Analytical Investigation,
W72-09615 8B

SOUTH COASTAL SUBREGION (CALIF)
Water Temperatures of California Streams, South Coastal Subregion,
W72-09755 2E

SOUTH CONCHO RIVER
Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

SOYBEAN OIL
Selective Hydrogenation of Soybean Oil. VI. Copper-on-Silica Gel Catalysts,
W72-09346 5A

SPAS
Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

SPECIES DIVERSITY
A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

SPECIFIC RESISTANCE
Crystal Seed Conditioning of Calcium Carbonate Sludge,
W72-09392 5F

Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

SPECTROFLUORIMETRY
The Spectrofluorimetric Determination of Sulphide,
W72-09253 5A

SPECTROMETERS
Hadamard-Transform Spectrometry: A New Analytical Technique,
W72-09418 2K

Measurements of 89Sr and 90Sr in Environmental Samples by a Low-Background Beta-Ray Spectrometer,
W72-09450 5A

SPECTROMETRY
Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

SPECTROPHOTOMETRY
Burner Memory Following Atomic Absorption Spectrophotometric Analysis of Moderately Volatile Organometallic Complexes,
W72-09247 5A

Iodine Colorimeter.
W72-09322 5A

Determination of Antimony in Geological Materials by Atomic Absorption Spectrometry,
W72-09328 5A

Determination of Aluminum in Water,
W72-09330 5A

Monitoring Metals in Marine Animals,
W72-09718 5A

SPECTROSCOPES
Rapid Identification and Determination of Alpha Emitters in Environmental Samples,
W72-09442 5A

SPECTROSCOPY
Lanthanide Shift Reagents as an Aid in the NMR Analysis of the Normal Alcohols C6 to C11,
W72-09347 5A

SPRAY CONDENSERS
Air Cooling for Condensation and Exhaust Heat Rejection in Large Generating Stations,
W72-09738 5D

SPRINGS
Investigation and Measurement of Radium in Ramsar Mineral Water,
W72-09266 5B

SPRUCE NEEDLES
Seasonal and Diurnal Changes in Moisture Contents and Water Deficits of Engelmann Spruce Needles,
W72-09606 2I

STABILIZATION
Soil Stabilization: A Mission Oriented Approach,
W72-09193 8D

STABLE ISOTOPES
Natural Isotopes in the Groundwater of the Tulum Valley, San Juan, Argentina,
W72-09276 2F

STAGING DESIGN EFFICIENCY
Water Treatment Plant Staging Policy,
W72-09289 5F

STAGING POLICIES
Water Treatment Plant Staging Policy,
W72-09289 5F

STANDARD OF LIVING
Economic Information for Environmental Quality Management,
W72-09147 6G

STANDARDS
Role of the Soil Conservation Service in Design of Feedlot Waste Management Facilities,
W72-09149 5G

Measurement of Alpha Particle Radioactivity of Water.
W72-09421 5A

Standard Method of Test for Radionuclides of Radium in Water.
W72-09422 5A

Standard Method of Test for Radioactive Cesium in Water.
W72-09423 5A

STATE WATER PLAN
A Water Planning Concept for the State of Washington.
W72-09308 6D

STATIONS
Water Pollution Monitoring Stations: An Ounce of Prevention,
W72-09374 5A

STATISTICAL METHODS
All Count Distributions are not Alike,
W72-09339 7B

Best Linear Unbiased Estimates of the Parameters of the Logistic Distribution Based on Selected Order Statistics,
W72-09348 7C

An Analysis of Variance for Categorical Data,
W72-09357 7C

On Bias Reduction in Estimation,
W72-09358 7C

The Statistics of Subsampling,
W72-09416 7B

Development and Trail use of Acceptance Sampling Plans for Compacted Embankments,
W72-09700 8D

STEAM
Gas-Solid Chromatography of Organic Compounds using Steam as the Carrier Gas,
W72-09566 5A

STOCHASTIC PROCESSES
Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

STOMATA
Responses of Stomata to Changes in Humidity,
W72-09783 2D

STORMS
Theory of Hail Growth,
W72-09205 2B

Estimation of the Occurrence of Hail and Hailstone Sizes,
W72-09206 2B

STRATFORD HURRICANE PROTECTION PROJECT (CONN.)
Hurricane Protection Project, Stratford, Connecticut (Draft Environmental Impact Statement).
W72-09478 8D

STREAM CHANNELIZATION
Stream Channelization: Conflict Between Ditchers, Conservationists,
W72-09538 6E

STREAMFLOW
Index of Surface-Water Records to September 30, 1970: Part 2.--South Atlantic Slope and Eastern Gulf of Mexico Basins.
W72-09224 2E

Characteristics of Streamflow at Gaging Stations in Shell Creek, Elkhorn River, and Salt Creek Basins, Nebraska,
W72-09556 2E

Ice Cover Formation and Associated Hydro-Dynamic Effects in the Lower Part of the River Rhine,
W72-09634 2C

Change of Velocity Distribution in a Cross-Section of a Freezing River and the Effect of Frazil Ice Loading on Velocity Distribution,
W72-09636 2C

Measurements of Ice Roughness and the Effect of Ice Cover on Water Levels in Three Norwegian Rivers,
W72-09638 2C

Ice Conditions in the Thjorsa River System,
W72-09641 2C

STREAMS
Optimal Search for Pollution Sources,
W72-09232 5B

Stream Capture in Kentucky Indicated by Distributional Records of Fundulus catenatus and etheostoma spectabile,
W72-09252 4A

A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

Occurrence and Distribution of Trace Elements in New Jersey Streams,
W72-09545 5A

Water Temperatures of California Streams, South Coastal Subregion,
W72-09755 2E

STREPTOCOCCUS
Microbiological Characterization of Activated Sludge in a Wastewater Treatment Plant Chemically Modified for Phosphorous Removal,
W72-09654 5D

STRESS
Infectious Pancreatic Necrosis Virus: Comparative Frequencies of Isolation From Feces and Organs of Brook Trout (Salvelinus fontinalis),
W72-09152 5A

STRONTIUM
Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

Tropospheric Scavenging of 90Sr and 3H,
W72-09528 5A

Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

STRONTIUM SAMPLING
Measurements of 89Sr and 90Sr in Environmental Samples by a Low-Background Beta-Ray Spectrometer,
W72-09450 5A

SUBSAMPLES
The Statistics of Subsampling,
W72-09416 7B

SUBSIDIES
The Economist's Approach to Pollution and Its Control,
W72-09145 6C

SUBSTRATE REMOVAL RATE
Stabilization of Refinery Waste Water with the Activated Sludge Process: Determination of Design Parameters,
W72-09593 5D

SUBSTRATE UTILIZATION
Taxonomy of Marine Bacteria: Beneckea nigrapulchrituda Sp. N.,
W72-09241 5A

SUBSURFACE DRAINS
Interceptor Drain Recovery of Canal Seepage,
W72-09197 8A

Region 7 Launches Program to reduce Subsurface Drain Costs,
W72-09697 4A

Drainage from Level and Sloping Land,
W72-09698 8B

SUBSURFACE INVESTIGATIONS
Mapping Buried Bedrock Topography With Gravity,
W72-09618 2F

SUBSURFACE MAPPING
Mapping Buried Bedrock Topography With Gravity,
W72-09618 2F

Ground-Water Volumes from Anomalous Mass Determinations for Alluvial Basins,
W72-09619 2F

SUCROSE
Response of Escherichia Coli B/r to High Concentrations of Sucrose in a Nutrient Medium,
W72-09364 5C

SULFATES
Variations of Sulfur Isotope Ratios in Samples of Water and Air near Chicago,
W72-09336 5B

Stoichiometry of the Coagulation of Color-Causing Organic Compounds with Ferric Sulfate,
W72-09695 5F

SULFIDES
The Spectrofluorimetric Determination of Sulphide,
W72-09253 5A

Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

SULFONATES
The Determination of Oil-Soluble Sulphonates by Two-Phase Titration,
W72-09375 5A

SULFUR RADIOISOTOPES
Variations of Sulfur Isotope Ratios in Samples of Water and Air near Chicago,
W72-09336 5B

SUNFISHES
Effects of Malathion on Two Warm-Water Fishes and Aquatic Invertebrates in Ponds,
W72-09567 5C

SUPPLY
Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

SURFACE RUNOFF
Le Van V. Hedlund Plumbing and Heating (Adjacent Landowners Obligation to Accept Natural Drainage of Surface Waters).
W72-09469 6E

SURFACE-WATER RECORDS INDEX
Index of Surface-Water Records to September 30, 1970: Part 2.--South Atlantic Slope and Eastern Gulf of Mexico Basins.
W72-09224 2E

SURFACE WATERS
Quality of Effluent from Swine Production Areas,
W72-09151 5B

Index of Surface-Water Records to September 30, 1970: Part 2.--South Atlantic Slope and Eastern Gulf of Mexico Basins.
W72-09224 2E

Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

Water Quality Records of the Snowy Mountains Region, Australia.
W72-09770 7C

SURFACTANTS
Effect of a Hostile Environment on Pseudomonas aeruginosa,
W72-09244 5C

Nuclear Magnetic Resonance Study of Interaction between Anionic and Nonionic Surfactants in their Mixed Micelles,
W72-09410 5A

SURGE COUNTERS
Portable Surge Counters Check Phase-to-Phase Surge Levels Between 115-KV Power Transformer Bushings at Blue Mesa Powerplant--Colorado River Storage Project,
W72-09187 8C

SURVEYS
Rural Water Supply in the Basement Complex of Western State, Nigeria,
W72-09275 3B

Water Resources Investigations in Mississippi, 1969.
W72-09534 7C

Water Resources Investigations in Montana, 1969.
W72-09535 7C

Water Resources Investigations in Kansas, 1968.
W72-09536 7C

SUSPENDED SOLIDS
Magnetic Flocculation of Steel Mill Waste Waters,
W72-09585 5D

SWITCHING SURGES
Portable Surge Counters Check Phase-to-Phase Surge Levels Between 115-KV Power Transformer Bushings at Blue Mesa Powerplant--Colorado River Storage Project,
W72-09187 8C

SYNCHRONIZED CULTURES
Continuously Synchronised Growth,
W72-09340 5C

SYNOPTIC ANALYSIS
Considerations Regarding Solar and Lunar Modulation of Geophysical Parameters, Atmospheric Electricity and Thunderstorms,
W72-09221 2B

SYNOPTIC METEOROLOGY
Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

SYNTHESIS
Response of Escherichia Coli B/r to High Concentrations of Sucrose in a Nutrient Medium,
W72-09364 5C

SYSTEMATCIS
Nucleic Acid Enzyme Studies of Nonfermentative Gram-Negative Bacteria Using Thin-Layer Chromatography,
W72-09408 5A

SYSTEMATICS
Trouts of the Upper Kern River Basin, California, with Reference to Systematics and Evolution of Western North American Salmo,
W72-09515 2E

Emergence Trap Collections of Trichoptera from an Oregon Stream,
W72-09571 5A

SYSTEMS ANALYSIS
Systems Analysis for Water Quality Management - Survey and Abstracts.
W72-09229 5G

Computer Software for Wastewater Treatment Plant Design,
W72-09233 5D

Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

TALLULAH CREEK (N.C.)
Tallulah Creek Watershed (Long Creek Portion), North Carolina (Draft Environmental Impact Statement).
W72-09475 8A

TANNERY WASTES
Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

TANNIN
Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

TASTE
Kerosene-Like Tainting in Australian Mullet,
W72-09678 5C

TAXES
The Economist's Approach to Pollution and Its Control,
W72-09145 6C

TCDD
Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

TECHNOLOGICAL CHANGE
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

TECHNOLOGY
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

TECHNOLOGY ASSESSMENT
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

TECHNOLOGY FORECASTING
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

TEMPERATURE
Effects of Incubation Temperature on the Salt Tolerance of Salmonella,
W72-09371 5C

Temperature Gradients in a Lake Ice Cover,
W72-09630 2C

Upper Temperature Tolerances of Some Estuarine Bivalves,
W72-09734 5C

TEMPERATURE PREDICTION
Mathematical Models for the Prediction of Thermal Energy Changes in Impoundments.
W72-09727 5B

An Analytical and Experimental Investigation of Surface Discharges of Heated Water,
W72-09729 5B

TEMPERATURE PREFERENCE
Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

TENNESSEE
Dyersburg, Tennessee (Draft Environmental Impact Statement).
W72-09480 8D

TENSILE STRENGTH
The Relationship Between Density and Tensile Strength in Snow,
W72-09611 2C

Tensile Tests of Ferrocement,
W72-09709 8F

TERRACES (GEOLOGIC)
Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

TERTIARY TREATMENT
Capital and Operating Costs--AWT,
W72-09140 5D

MBF Pilot Plant Filtration of Combined Municipal and Paper Mill Waste,
W72-09301 5D

Chemical-Physical Wastewater Treatment Phase 2: Activated Carbon Adsorption and Polishing,
W72-09302 5D

TEST RESULTS
Drainage from Level and Sloping Land,
W72-09698 8B

TESTING
Repeatability and Reproducibility,
W72-09310 7C

TEXAS
Hitson, C and L and Washburn Draws, Watershed, Texas (Draft Environmental Impact Statements).
W72-09476 4B

A Comparison of Mass-Transfer and Climatic-Index Evaporation Computations from Small Reservoirs in Texas,
W72-09555 2H

Flushing Studies, Victorial Channel, Victoria, Texas: Hydraulic Model Investigation,
W72-09761 8B

TEXTILES
The Effects of Cobalt-60 Radiation on Textile Processing Waste,
W72-09391 5D

THALASSIA-TESTUDINUM-M
The Water Economy of the Sea Grass Thalassia testudinum,
W72-09784 2L

THERMAL POLLUTION
Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

Method and Apparatus for Withdrawing Heat from Industrial Plants, Especially Power Plants,
W72-09489 5D

The Effect of Temperature on the Feeding Rate and Behavior of the Caddisfly Hydropsyche frisoni,
W72-09686 5C

Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

Aquatic Life Survey of the Wabash River--With Special Reference to the Effects of Thermal Effluents on Populations of Macroinvertebrates and Fish, 1967-1969,
W72-09725 5C

A Method for Predicting the Performance of Natural Draft Cooling Towers.
W72-09726 5D

Research on the Physical Aspects of Thermal Pollution.
W72-09728 5B

An Analytical and Experimental Investigation of Surface Discharges of Heated Water,
W72-09729 5B

Methods for Evaluating Effects of Transient Conditions in Heavily Loaded and Extensively Regulated Streams,
W72-09731 5B

The Dissipation of Heat from Thermal Discharges,
W72-09732 5B

Potential Uses of Waste Waters and Heated Effluents,
W72-09733 5B

Hazelwood Power Station - Data Collection and Analysis of Cooling Pond Performance,
W72-09737 5D

Air Cooling for Condensation and Exhaust Heat Rejection in Large Generating Stations,
W72-09738 5D

Condenser Selection for Various Cooling Water Systems,
W72-09739 5D

Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

Power Plant Siting, Performance, and Economics with Dry Cooling Tower Systems,
W72-09741 5D

THERMAL POWER
Kinetics of OH Radical Reactions in Irradiated Ordinary and Supercooled Water,
W72-09428 5B

THERMAL POWERPLANTS
Meteorological Effects of Cooling Tower Plumes,
W72-09305 2B

THERMAL SPRINGS
Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

THERMAL STRATIFICATION
Selective Withdrawal Studies for the Fish Hatchery Outlets at Pueblo Dam--Mathematical and Physical Models,
W72-09194 8B

Research on the Physical Aspects of Thermal Pollution.
W72-09728 5B

THERMAL STRESS
The Effect of Temperature on the Feeding Rate and Behavior of the Caddisfly Hydropsyche frisoni,
W72-09686 5C

THERMAL WATER
Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

THERMISTOR ANEMOMETER
An Inexpensive Heated Thermistor Anemometer,
W72-09610 2D

THERMODYNAMICS
Partial Pressure of Gases Dissolved at Great Depth,
W72-09537 1B

THESAURI
River and Lake Ice Terminology,
W72-09625 2C

THIN LAYER CHROMATOGRAPHY
Thin Layer Chromatography and Infra-Red and Ultra-Violet Spectra of Fenthion and Seven of its Degradation Products,
W72-09182 5A

Simple Device for Transferring and Eluting Thin-Layer Chromatographic Fractions,
W72-09342 2K

A Comparison of Some Ready-For-Use Thin Layers for the Separation of Heavy Metals with Butanol-3 N HCl,
W72-09353 5A

Nucleic Acid Enzyme Studies of Nonfermentative Gram-Negative Bacteria Using Thin-Layer Chromatography,
W72-09408 5A

A Critical study of Some Parameters in Quantitative in situ Investigations of Thin-Layer Chromatography by Light Absorption Methods,
W72-09411 5A

THIOBACILLUS FERROOXIDANS
Chalcocite Oxidation and Coupled Carbon Dioxide Fixation by Thiobacillus Ferrooxidans,
W72-09359 5C

THO VAPOR
Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

THORIUM
Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

THORON
Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

THUNDERSTORMS
Miniature Whirlwinds Produced in the Laboratory by High-Voltage Electrical Discharges,
W72-09216 2B

Eyewitness Tornado Observations Obtained with Telephone and Tape Recorder,
W72-09217 2B

Mountain-Peak Potential-Gradient Measurements and the Andes Glow,
W72-09219 2B

TIDES
Hurricane Protection Project, Stratford, Connecticut (Draft Environmental Impact Statement).
W72-09478 8D

TILLAGE
On The Minimal Soil Tillage In Growing Maize Under Irrigation, (In Bulgarian),
W72-09753 3F

TIN
New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

TLD SYSTEM
A Quick and Convenient Measurement Method for Surface and Liquid Contamination Using the TLD System,
W72-09451 5A

TNT
Analysis of Explosives in Sea Water,
W72-09312 5A

TOLERANCE INTERVALS
On the use of Tolerance Intervals in Acceptance Sampling by Attributes,
W72-09311 7C

TOLUENE EXTRACTION
The Toluene Extraction of Some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part 1. Extraction Behaviour of As, Au, Bi, Br, Cd, Cu, Ga, Ge, In, Hg, Mo, Pb, Sb, Se, Sn, W and Zn,
W72-09367 5A

TOMBSTONE (ARIZ)
Available Soil Water: Time-Distribution in a Warm Season Rangeland,
W72-09271 2A

TOPOGRAPHY
Topographic Effects Apparent in Nocturnal Temperature Profiles in a Conifer Canopy,
W72-09608 2D

Mapping Buried Bedrock Topography With Gravity,
W72-09618 2F

Beach Water Table and Beach-Profile Measuring Equipment,
W72-09758 7B

TORNADOES
Miniature Whirlwinds Produced in the Laboratory by High-Voltage Electrical Discharges,
W72-09216 2B

Eyewitness Tornado Observations Obtained with Telephone and Tape Recorder,
W72-09217 2B

Point Discharge Current in Blackwell, Oklahoma, June 1969 - September 1970,
W72-09218 2B

TORRANCE COUNTY (N MEX)
Land Classification for Irrigation, Torrance County,
W72-09664 3F

TORSION SHEAR TESTS
A New Ring Shear Apparatus and its Application to the Measurement of Residual Strength,
W72-09706 8D

TOTAL VOLATILE SOLIDS
Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

TOWER SPOTTING
The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

TOXAPHENE
Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

TOXICANTS
Problems in Water Toxicology (Voprosy vodnoy toksikologii).
W72-09646 5C

Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

TOXICITY
Quality of Effluent from Swine Production Areas,
W72-09151 5B

Chlorinated Municipal Waste Toxicities to Rainbow Trout and Fathead Minnows.
W72-09154 5C

Pollutants and Food-Chains,
W72-09402 5C

Toxicity Assessment of Treated Municipal Wastewaters,
W72-09582 5D

Operation of a Central Waste Treatment System-Bayport Industrial Complex,
W72-09586 5D

Problems in Water Toxicology (Voprosy vodnoy toksikologii).
W72-09646 5C

Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

Determination of the Toxicity of Contaminated Freshwater with Respect to Certain Hydrobionts (Opredeleniye toksichnosti zagryaznennykh presnykh vod v otnoshenii nekotorykh gidrobiontov),
W72-09649 5C

Effects of Petroleum Fractions on the Early Development of a Sea Urchin,
W72-09677 5C

The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis Macrochirus raf.),
W72-09679 5C

TOXICOLOGY
Problems in Water Toxicology (Voprosy vodnoy toksikologii).
W72-09646 5C

Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

Problem of Pesticides in Water Toxicology (Problema pestitsidov v vodnoy toksikologii),
W72-09650 5C

Effects of DDT and Hexachlorocyclohexane on Aquatic Animals (K voprosu o vliyanii DDT i geksakhlorana na vodnyye organizmy),
W72-09652 5C

TOXINS
Studies on a Piscicidal Constituent of Hura crepitans: I. Isolation and Characterization of Huratoxin and its Piscicidal Activity,
W72-09779 5C

TRACE ELEMENTS
The Role of Minor Nutrients in Limiting the Productivity of Aquatic Ecosystems,
W72-09158 5C

Rapid Photochemical Determination of Uranium (VI) At Trace Levels,
W72-09254 5A

The Toluene Extraction of Some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part 1. Extraction Behaviour of As, Au, Bi, Br, Cd, Cu, Ga, Ge, In, Hg, Mo, Pb, Sb, Se, Sn, W and Zn,
W72-09367 5A

TRACE ELEMENTS

The Toluene Extraction of some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part II. Determination of Arsenic and Antimony in Biological Materials at Su bmicrogram Levels,
W72-09368 5A

The Determination of Traces of Nickel by Gas-Liquid Chromatography,
W72-09369 5A

Occurrence and Distribution of Trace Elements in New Jersey Streams,
W72-09545 5A

Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

Biogeochemical Sources of Iodine and Cobalt in Moldavia (Biogeokhimicheskiye provintsii yoda i kobalta v Moldavii),
W72-09643 2K

TRACERS

Natural Isotopes in the Groundwater of the Tulum Valley, San Juan, Argentina,
W72-09276 2F

Remote Sensing Acquisition of Tracer Dye and Infrared Imagery Information and Interpretation for Industrial Discharge Management,
W72-09550 5B

Studies of Sediment Transport in the Columbia River Estuary,
W72-09551 5B

TRANSFER

Effects of Water Deficiency on Transfer of Assimilates From Leaves Into Fruit Organs of Cotton, (In Russian),
W72-09776 3F

TRANSMISSION (ELECTRICAL)

New Incentives for Underground Transmission,
W72-09186 8C

TRANSMISSION LINES

The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

TRANSMISSION TOWERS

The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

TRANSPIRATION

Methods for Clean Condensation of Atmospheric Moisture for Its Use in a Closed Ecological System,
W72-09583 5D

The Water Economy of the Sea Grass Thalassia testudinum,
W72-09784 2L

Daily Dynamics of Transpiration of Upper and Lower Sides of Leaves in Some Monocotyledonous and Dicotyledonous Plants, (In Ukrainian),
W72-09785 2D

TRANSPORTATION PLANNING

The Master Plan, Town of Poestenkill, N.Y., Volume 2.
W72-09300 6D

TRANSURANIUM ELEMENTS

Rapid Determination of Some Transuranium Elements in Biological Material by Liquid Scintillation Counting,
W72-09354 5A

TRAWLING

Catches of Postlarval White Shrimp, 'Penaeus setiferus' (Linn.), and Brown Shrimp, P. aztecus ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967,
W72-09674 2L

TREATIES

President Nixon asks Senate Approval of Conventions on Pollution of the Sea by Oil,
W72-09485 6E

Offshore Oil Pollution (Message from President Nixon to Congress),
W72-09486 6E

TREATMENT FACILITIES

The Effects of Oil on Sewers and Treatment Plants,
W72-09395 5D

Design of the Beddington Works of the London Borough of Croydon,
W72-09400 5D

Operation of Bybrook Sewage Works, Ashford, Kent, 1965-68,
W72-09401 5D

Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

TREATMENT PLANT STAGING

Water Treatment Plant Staging Policy,
W72-09289 5F

TRICHODERMA VIRGATUM

Methylation of Pentachlorophenol by Trichoderma Virgatum,
W72-09562 5B

TRICKLING FILTERS

Organic Concentration and Hydraulic Loading Versus Organic Loading in Evaluation of Trickling Filter Performance,
W72-09596 5D

Multi-Stage Plastic Media Treatment Plants,
W72-09598 5D

TRIFLURALIN

Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

TRIMETHYLSILYLATION

Determination of Nanomolar Quantities of Free Amino Acids Dissolved in North Atlantic Ocean Waters,
W72-09343 5A

TRITIUM

Penetration of Bog Peats and Lake Sediments by Tritium From Atmospheric Fallout,
W72-09240 5B

Monitoring of Tritium Under Emergency Conditions,
W72-09443 5A

Tropospheric Scavenging of 90Sr and 3H,
W72-09528 5A

Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

TROGLOBITIC ASELLIDS

A New Species of Troglobitic Asellid From Illinois,
W72-09520 5C

TROPHIC GROUPS

Animal-Sediment Relations and Community Analysis of a Florida Estuary,
W72-09177 5C

TROPHIC LEVELS

Ecological Dynamics of Watersheds,
W72-09565 2A

Phosphorus and Eutrophication in the Pamlico River Estuary, N. C., 1966-1969 - A Summary,
W72-09655 5C

TROPOSPHERE

Tropospheric Scavenging of 90Sr and 3H,
W72-09528 5A

TROUT

Trouts of the Upper Kern River Basin, California, with Reference to Systematics and Evolution of Western North American Salmo,
W72-09515 2E

TSUNAMIS

Determination of the Zone of Origin of Tsunamis (Opredeleniye mesta vozniknoveniya tsunami),
W72-09280 2L

The Approximate Theories of Pneumatic Wave Generators,
W72-09541 8B

TUBIFICIDS

The Relationships Between 32P Accumulation in Algae, Bacteria and Tubificids,
W72-09668 5C

TUBULAR REVERSE OSMOSIS MODULE

Evaluation of Single and Multiple Pass Seawater Desalination.
W72-09518 3A

TULUM VALLEY (ARGENTINA)

Natural Isotopes in the Groundwater of the Tulum Valley, San Juan, Argentina,
W72-09276 2F

TURBIDIMETERS

Understanding Turbidity Measurement,
W72-09671 5F

TURBIDITY

Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

System for Measuring Organic Content of Water,
W72-09493 5D

Understanding Turbidity Measurement,
W72-09671 5F

TURBULENCE

Stream Turbulence Effects on Turbulent Boundary Layer,
W72-09257 2E

Temperature and Flow Conditions During the Formation of River Ice,
W72-09631 2C

TURBULENT BOUNDARY LAYERS
Stream Turbulence Effects on Turbulent Boundary Layer,
W72-09257 2E

TURBULENT FLOW
Stream Turbulence Effects on Turbulent Boundary Layer,
W72-09257 2E

TWIN BUTTES RESERVOIR
Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

TWO-PHASE TITRATION
The Determination of Oil-Soluble Sulphonates by Two-Phase Titration,
W72-09375 5A

ULTIMATE LOADS
Tensile Tests of Ferrocement,
W72-09709 8F

ULTRAFILTRATION
Membrane Processing of Cottage Cheese Whey for Pollution Abatement.
W72-09385 5D

ULTRAVIOLET SPECTRA
Thin Layer Chromatography and Infra-Red and Ultra-Violet Spectra of Fenthion and Seven of its Degradation Products,
W72-09182 5A

UNDERGROUND CABLES
New Incentives for Underground Transmission,
W72-09186 8C

UNDERGROUND NUCLEAR EXPLOSIONS
Infill of Nuclear Rubble Chimneys by Ground Water,
W72-09617 4B

UNDERGROUND STREAMS
Numerical Methods for Determining Streamlines and Isopressures for Use in Fluid-Flow Studies,
W72-09754 2F

UNDERGROUND TRANSMISSION LINES
New Incentives for Underground Transmission,
W72-09186 8C

UNDERWATER CONSTRUCTION
Grouting Preplaced Aggregate to Form Concrete,
W72-09190 8F

UNDERWATER FOUNDATIONS
Grouting Preplaced Aggregate to Form Concrete,
W72-09190 8F

UNIT COSTS
Capital and Operating Costs--AWT,
W72-09140 5D

UNITED NATIONS
U.N. Adopts Principles Governing Seabed Exploitation and Decides to Convene Comprehensive Law-of-the-Sea Conference in 1973.
W72-09484 6E

UNITED STATES
Summary of Floods in the United States During 1967,
W72-09222 2E

On the Classification and Trends of Long Period Sea Level Series,
W72-09757 7C

UNSTEADY FLOW
Infill of Nuclear Rubble Chimneys by Ground Water,
W72-09617 4B

URANIUM
Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

URANIUM SALTS
Process for Removal of Inorganic and Organic Matter from Waste Water Systems,
W72-09500 5D

URANIUM (VI)
Rapid Photochemical Determination of Uranium (VI) At Trace Levels,
W72-09254 5A

URBAN GOALS
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

URBAN HYDROLOGY
Reconnaissance Study of Sediment Transported by Streams, Island of Oahu,
W72-09759 2J

URBANIZATION
The Master Plan, Town of Poestenkill, N.Y., Volume 2.
W72-09300 6D

USER FEES
The Economist's Approach to Pollution and Its Control,
W72-09145 6C

USSR
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

Distribution and Composition of Carbonates in the Upper Layer of Bottom Sediments of the Atlantic Ocean (Raspredelenive i sostav karbonatov v verkhnem sloye donnykh osadkov Atlanticheskogo okeana),
W72-09256 2J

Information Bulletin on Hydrometeorological Instruments and Investigation Techniques (Informatsionnyye materialy po gidrometeorologicheskim priboram i metodam nablyudeniy).
W72-09278 7B

Glaciers and Geological Evolution of the Earth (Oledeneniya i geologicheskoye razvitiye zemli),
W72-09279 2C

Determination of the Zone of Origin of Tsunamis (Opredeleniye mesta vozniknoveniya tsunami),
W72-09280 2L

Water Erosion of Soils in the Ob' River Region Near Novosibirsk (Vodnaya eroziya pochv Novosibirskogo Priob'ya),
W72-09281 2J

History of the World's Oceans (Istoriya Mirovogo okeana).
W72-09282 2L

New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

Geologic Age of Ancient Lake Sediments of the Mologo-Sheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

Biogeochemical Sources of Iodine and Cobalt in Moldavia (Biogeokhimicheskiye provintsii yoda i kobalta v Moldavii),
W72-09643 2K

Problems in the Utilization of Water Resources (Problemy ispol'zovaniya vodnykh resursov).
W72-09644 8B

Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

Problems in Water Toxicology (Voprosy vodnoy toksikologii).
W72-09646 5C

Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

Present State and Development of Scientific Research on Prevention of Fishery Pollution (Sostoyaniye i perspektivy nauchno-issledovatel'skikh rabot po probleme okhrany rybokhozyaystvennykh vodoyemov ot zagryazneniya),
W72-09648 5C

Determination of the Toxicity of Contaminated Freshwater with Respect to Certain Hydrobionts (Opredeleniye toksichnosti zagryaznennykh presnykh vod v otnoshenii nekotorykh gidrobiontov),
W72-09649 5C

Problem of Pesticides in Water Toxicology (Problema pestitsidov v vodnoy toksikologii),
W72-09650 5C

Effects of Pesticides on the Life of a Water Body (K voprosu o vliyanii pestitsidov na zhizn' vodoyema),
W72-09651 5C

Effects of DDT and Hexachlorocyclohexane on Aquatic Animals (K voprosu o vliyanii DDT i geksakhlorana na vodnyye organizmy),
W72-09652 5C

Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh

usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

Atmospheric Precipitation in the Armenian SSR (Atmosfernyye osadki v Armyanskoy SSR),
W72-09746 2B

Long-Term Cyclic Fluctuations of Atmospheric Precipitation in the USSR (Mnogoletniye tsiklicheskiye kolebaniya atmosfernykh osadkov na territorii SSSR),
W72-09747 2B

Moisture Variations in a Model Sod-Podzolic Soil (O nekotorykh zakonomernostyakh var-'irovaniya vlazhnosti v model'noy dernovo-podzolistoy pochve),
W72-09748 2G

Moisture Content of Hummocky Sands Under Pine Plantings in the Middle Don Region (Vlazhnost'bugristykh peskov pod sosnovymi nasazhdeniyami na srednem Donu),
W72-09749 2G

Groundwater and Drainage-Water Mineralization in the Mugan-sal'yany Region (Mineralizatsiya gruntovykh i drenazhnykh vod Mugano-Sal'yanskogo massiva),
W72-09750 4B

Effects of Irrigation on Salt Regime of Dark-Chestnut Terrace Soils in the Transvolga Region (Vliyaniye orosheniya na solevoy rezhim terrasovykh temno-kashtanovykh pochv Zavolzh'ya),
W72-09751 3F

UTAH

Ground-Water Resources of Cache Valley, Utah and Idaho,
W72-09558 4B

UZBEK SSR

Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

VACUUM DRYING

Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

VACUUM FILTRATION

Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

VARIABILITY

Best Linear Unbiased Estimates of the Parameters of the Logistic Distribution Based on Selected Order Statistics,
W72-09348 7C

VARIANCE

An Analysis of Variance for Categorical Data,
W72-09357 7C

The Statistics of Subsampling,
W72-09416 7B

VEGETABLE CROPS

Handling Waste Disposal at a Major Food Plant,
W72-09591 5D

VEGETATION

Vegetation Stripes on Sheet Wash Surfaces,
W72-09307 2I

VEGETATION EFFECTS

Vegetation Stripes on Sheet Wash Surfaces,
W72-09307 2I

Chaparral Treatment Effects on Streamflow,
W72-09604 3B

VIABILITY

Effects of Organochlorine Insecticides on Bacterial Growth, Respiration and Viability,
W72-09361 5C

VICTORIA CHANNEL (TEX)

Flushing Studies, Victorial Channel, Victoria, Texas: Hydraulic Model Investigation,
W72-09761 8B

VINYL PEPTIDES

Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

VIRGINIA

Water Resources Research in Virginia, Annual Report for Fiscal Year 1971.
W72-09199 9D

The Virginia Flood of 1969,
W72-09760 2E

VIRUSES

Infectious Pancreatic Necrosis Virus: Comparative Frequencies of Isolation From Feces and Organs of Brook Trout (Salvelinus fontinalis),
W72-09152 5A

VOLATILITY

The Effect of Chloroform in Sewage on the Production of Gas From Laboratory Digesters,
W72-09398 5D

VOLTAGE DIVIDERS

Portable Surge Counters Check Phase-to-Phase Surge Levels Between 115-KV Power Transformer Bushings at Blue Mesa Powerplant--Colorado River Storage Project,
W72-09187 8C

VOLUMETRIC ANALYSIS

The Determination of Oil-Soluble Sulphonates by Two-Phase Titration,
W72-09375 5A

WABASH RIVER (IND)

Aquatic Life Survey of the Wabash River--With Special Reference to the Effects of Thermal Effluents on Populations of Macroinvertebrates and Fish, 1967-1969,
W72-09725 5C

WASHINGTON

Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

A Water Planning Concept for the State of Washington.
W72-09308 6D

Manson Unit, Chelan Division, Chief Joseph Dam Project, Washington (Final Environmental Impact Statement).
W72-09473 8C

Applications of Some Numerical Models to Pacific Northwest Estuaries,
W72-09549 5B

Ecological Dynamics of Watersheds,
W72-09565 2A

WASTE CHARACTERIZATION

The Characteristics of Residues in Spent Chlorination Liquor,
W72-09592 5D

WASTE DISPOSAL

The Economist's Approach to Pollution and Its Control,
W72-09145 6C

Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

Cost of Waste Treatment in the Meat Packing Industry,
W72-09397 5D

Disposal of Solid Aluminum Process Wastes in the Ocean,
W72-09552 5C

WASTE DISPOSAL WELLS

The Role of the U.S. Geological Survey in Waste Disposal Monitoring,
W72-09616 5B

WASTE GENERATION FACTOR

Cost of Waste Treatment in the Meat Packing Industry,
W72-09397 5D

WASTE PICKLE LIQUOR

Phosphate Precipitation with Ferrous Iron,
W72-09388 5D

WASTE STORAGE

Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

Present Status of the U.S. Program on the Solidification of High Level Wastes,
W72-09584 5D

WASTE WATER DISPOSAL

A Master Sewerage Plan for Burlington County, New Jersey.
W72-09303 6D

WASTE WATER TREATMENT

Capital and Operating Costs--AWT,
W72-09140 5D

Wastewater Treatment and Eutrophication,
W72-09170 5C

Factors Affecting Nitrification Kinetics,
W72-09174 5D

Computer Software for Wastewater Treatment Plant Design,
W72-09233 5D

MBF Pilot Plant Filtration of Combined Municipal and Paper Mill Waste,
W72-09301 5D

A Master Sewerage Plan for Burlington County, New Jersey.
W72-09303 6D

Basin Management for Water Reuse.
W72-09381 5D

A Mathematical Model of a Final Clarifier.
W72-09382 5D

Wastewater Ammonia Removal by Ion Exchange.
W72-09383 5D

Wastewater Demineralization by Ion Exchange,
W72-09384 5D

Membrane Processing of Cottage Cheese Whey for Pollution Abatement.
W72-09385 5D

Waste Treatment Lagoons-State of the Art.
W72-09386 5D

Phosphate Precipitation with Ferrous Iron,
W72-09388 5D

Activated Sludge Processing.
W72-09389 5D

Liquid Wastes from Canning and Freezing Fruits and Vegetables.
W72-09390 5D

The Effects of Cobalt-60 Radiation on Textile Processing Waste,
W72-09391 5D

Filtration of Water and Wastewater,
W72-09393 5D

The Effects of Oil on Sewers and Treatment Plants,
W72-09395 5D

Development and Use of a Large-Volume Automatic Respirometer,
W72-09396 5D

Cost of Waste Treatment in the Meat Packing Industry,
W72-09397 5D

The Effect of Chloroform in Sewage on the Production of Gas From Laboratory Digesters,
W72-09398 5D

The Use of Sewage Effluent at South African Pulp and Paper Industries' Enstra Bleached Kraft Mill,
W72-09399 5D

Design of the Beddington Works of the London Borough of Croydon,
W72-09400 5D

Operation of Bybrook Sewage Works, Ashford, Kent, 1965-68,
W72-09401 5D

Cook Industries V. Carlson (Right of Summary Abatement of Private Nuisance).
W72-09471 6E

Waste Water Treatment Process,
W72-09492 5D

Flotation of Solids from Waste Waters,
W72-09496 5D

Removal of Inorganic Species by Liquid Membrane,
W72-09497 5D

Process for Removal of Inorganic and Organic Matter from Waste Water Systems,
W72-09500 5D

Biochemical Process,
W72-09502 5D

Flocculation of Particles Dispersed in Aqueous Media and Flocculants Used Therein,
W72-09505 5D

Experimental Evaluation of Fibrous Bed Coalescers for Separating Oil-Water Emulsions.
W72-09580 5D

Effect of Porous Structure on Carbon Activation.
W72-09581 5D

Toxicity Assessment of Treated Municipal Wastewaters,
W72-09582 5D

Magnetic Flocculation of Steel Mill Waste Waters,
W72-09585 5D

Operation of a Central Waste Treatment System-Bayport Industrial Complex,
W72-09586 5D

The Operation of Pressure Type Sand Filters for Hot Mill Waste Waters,
W72-09587 5D

Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

The Clarification of Paper Mill Effluents by Activated Carbon Produced from Waste Sulfite Liquor and Other Refuse,
W72-09589 5D

Algal Influences on Dieoff Rates of Indicator Bacteria,
W72-09590 5D

Handling Waste Disposal at a Major Food Plant,
W72-09591 5D

The Characteristics of Residues in Spent Chlorination Liquor,
W72-09592 5D

Stabilization of Refinery Waste Water with the Activated Sludge Process: Determination of Design Parameters,
W72-09593 5D

Plating and Industrial Waste Treatment at the Expanded Plant of Fisher Body, Elyria, Ohio,
W72-09594 5D

Organic Concentration and Hydraulic Loading Versus Organic Loading in Evaluation of Trickling Filter Performance,
W72-09596 5D

Electrically Induced Coagulation of Lignin from Kraft Mill Wastewaters,
W72-09597 5D

Multi-Stage Plastic Media Treatment Plants,
W72-09598 5D

Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

The Treatment of Industrial Wastewater for Reuse--Chrysler Indianapolis Foundry,
W72-09600 5D

Arctic Waste Management,
W72-09601 5D

Biological Factors in Aerator Performance,
W72-09602 5D

Microbiological Characterization of Activated Sludge in a Wastewater Treatment Plant Chemically Modified for Phosphorous Removal,
W72-09654 5D

Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

WASTES

Summer Conference of Society for Applied Bacteriology, Liverpool, 13-15 July 1971,
W72-09675 5C

Potential Uses of Waste Waters and Heated Effluents,
W72-09733 5B

WASTEWATER TREATMENT

Chemical-Physical Wastewater Treatment Phase 2: Activated Carbon Adsorption and Polishing,
W72-09302 5D

WATER

Standard Method of Test for Radioactive Cesium in Water.
W72-09423 5A

WATER ANALYSIS

Determination of Aluminum in Water,
W72-09330 5A

Measurement of Alpha Particle Radioactivity of Water.
W72-09421 5A

Standard Method of Test for Radionuclides of Radium in Water.
W72-09422 5A

Standard Method of Test for Radioactive Cesium in Water.
W72-09423 5A

Occurrence and Distribution of Trace Elements in New Jersey Streams,
W72-09545 5A

Determination of Nitrilotriacetic acid in Inland Waters by Gas Chromatography of the Trimethyl Ester,
W72-09711 5A

Water Quality Records of the Snowy Mountains Region, Australia.
W72-09770 7C

WATER BALANCE

Available Soil Water: Time-Distribution in a Warm Season Rangeland,
W72-09271 2A

Rime Contributes to Water Balance in High-Elevation Aspen Forests,
W72-09613 2C

WATER CHEMISTRY

Geochemical Study of the Ground Water of the 'Sables Inferieurs' Confined Aquifer, of the Aquitaine Basin (Etude Geochimique de la

WATER CHEMISTRY

Nappe des 'Sables Inferieurs' du Bassin d'Aquitaine),
W72-09269 2F

WATER CIRCULATION
On the Water of the Canadian Arctic Archipelago, an Atlas Presentation of 1961 and 1962 Data,
W72-09227 7C

WATER COLLING
Kinetics of OH Radical Reactions in Irradiated Ordinary and Supercooled Water,
W72-09428 5B

WATER CONSERVATION
Water Budget Analysis of a New England Wetland,
W72-09265 3B

Problems in the Utilization of Water Resources (Problemy ispol'zovaniya vodnykh resursov).
W72-09644 8B

WATER CONSUMPTION
Arctic Waste Management,
W72-09601 5D

WATER COOLING
Meteorological Effects of Cooling Tower Plumes,
W72-09305 2B

WATER COSTS
Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

WATER DEFICIENCY
Effects of Water Deficiency on Transfer of Assimilates From Leaves Into Fruit Organs of Cotton, (In Russian),
W72-09776 3F

WATER DEMAND
Rate Philosophy,
W72-09142 6C

Water Treatment Plant Staging Policy,
W72-09289 5F

Water and Land Resources, Ouachita River Basin in Arkansas,
W72-09309 6D

Agricultural Water Demands,
W72-09526 6D

Geologic and Hydrologic Study of Northern Sardinia: Report Number 3. The Provision of Water for the Region of Anglona, (In Italian),
W72-09781 6D

WATER DISTRIBUTION (APPLIED)
Optimal Distribution of Water to Irrigation Canals,
W72-09195 3F

WATER EROSION
Water Erosion of Soils in the Ob' River Region Near Novosibirsk (Vodnaya eroziya pochv Novosibirskogo Priob'ya),
W72-09281 2J

Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

WATER LAW
Water Quality Control in Oregon.
W72-09669 5G

WATER LEVELS
Ground-Water Levels in the Lower Arkansas River Valley of Colorado, 1968-72.
W72-09559 4B

Plant Indicators for pH and Water Level in Peatlands at Candle Lake, Saskatchewan,
W72-09730 2H

On the Classification and Trends of Long Period Sea Level Series,
W72-09757 7C

Analysis of the Ground-Water System by Electrical-Analog Model, Avra Valley, Pima and Pinal Counties, Arizona,
W72-09765 7C

WATER LOSS
Method and Apparatus for Withdrawing Heat from Industrial Plants, Especially Power Plants,
W72-09489 5D

Chaparral Treatment Effects on Streamflow,
W72-09604 3B

WATER MANAGEMENT
Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

WATER MANAGEMENT (APPLIED)
Systems Analysis for Water Quality Management - Survey and Abstracts.
W72-09229 5G

Stream Channelization: Conflict Between Ditchers, Conservationists,
W72-09538 6E

WATER-MEADOWS
The Formation and Maintenance of Water-Meadows in Hampshire, England,
W72-09707 4A

WATER MOVEMENT
Water Movement in a Plant Cell on Application of Hydrostatic Pressure,
W72-09786 2I

WATER POLICY
A Water Planning Concept for the State of Washington.
W72-09308 6D

Proceedings - Workshop on Sediment Control.
W72-09656 4D

Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

WATER POLLUTION
The Nation's Rivers,
W72-09188 5G

Pollution Prices in a General Equilibrium Model,
W72-09235 5G

Measurement of Alpha Particle Radioactivity of Water.
W72-09421 5A

Standard Method of Test for Radionuclides of Radium in Water.
W72-09422 5A

Standard Method of Test for Radioactive Cesium in Water.
W72-09423 5A

Plan for the Management of AEC-Generated Radioactive Wastes,
W72-09424 5G

Recreational Use of the Columbia River: Evaluation of Environmental Exposure,
W72-09426 6B

Environmental Radioactivity in New Zealand. Quarterly Report, Oct.-Dec. 1970.
W72-09429 5A

Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

Polluted Water: A Challenge to Forensic Biology,
W72-09498 5G

Public Regulation of Water Quality in the United States,
W72-09527 5G

Electric Power and the Environment.
W72-09529 6G

Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

Determination of the Toxicity of Contaminated Freshwater with Respect to Certain Hydrobionts (Opredeleniye toksichnosti zagryaznennykh presnykh vod v otnoshenii nekotorykh gidrobiontov),
W72-09649 5C

The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis Macrochirus raf.),
W72-09679 5C

WATER POLLUTION CONTROL
Nutrient Management in the Potomac Estuary,
W72-09171 5C

How Seattle Beat Pollution,
W72-09179 5C

Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

President's Message--Environmental Protection,
W72-09460 6E

U.S. Opposes Unilateral Extension by Canada of High Seas Jurisdiction.
W72-09472 6E

A Statutory Analysis of Florida's Water Pollution Control Legislation,
W72-09479 6E

Offshore Oil Pollution (Message from President Nixon to Congress),
W72-09486 6E

Public Regulation of Water Quality in the United States,
W72-09527 5G

Design and Construction of a Saltwater Environment Simulator,
W72-09553 5C

Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

Summer Conference of Society for Applied Bacteriology, Liverpool, 13-15 July 1971,
W72-09675 5C

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

WATER POLLUTION EFFECTS

Possible DDT Mortality in Young Rainbow Trout,
W72-09141 5C

Problems in Water Toxicology (Voprosy vodnoy toksikologii).
W72-09646 5C

Present State and Development of Scientific Research on Prevention of Fishery Pollution (Sostoyaniye i perspektivy nauchno-issledovatel'skikh rabot po probleme okhrany rybokhozyaystvennykh vodoyemov ot zagryazneniya),
W72-09648 5C

Effects of DDT and Hexachlorocyclohexane on Aquatic Animals (K voprosu o vliyanii DDT i geksakhlorana na vodnyye organizmy),
W72-09652 5C

The Santa Barbara Oil Spill Part 2: Initial Effects on Intertidal and Kelp Bed Organisms,
W72-09683 5C

Insidious Alteration of the Estuarine Environment,
W72-09717 5C

Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

Aquatic Life Survey of the Wabash River--With Special Reference to the Effects of Thermal Effluents on Populations of Macroinvertebrates and Fish, 1967-1969,
W72-09725 5C

Methods for Evaluating Effects of Transient Conditions in Heavily Loaded and Extensively Regulated Streams,
W72-09731 5B

WATER POLLUTION SOURCES

Chlorinated Municipal Waste Toxicities to Rainbow Trout and Fathead Minnows.
W72-09154 5C

Optimal Search for Pollution Sources,
W72-09232 5B

Measurement of Alpha Particle Radioactivity of Water.
W72-09421 5A

Standard Method of Test for Radionuclides of Radium in Water.
W72-09422 5A

Plan for the Management of AEC-Generated Radioactive Wastes,
W72-09424 5G

Environmental Radioactivity in New Zealand. Quarterly Report, Oct.-Dec. 1970.
W72-09429 5A

Rapid Determination of Gamma-Ray Emitting Radionuclides in Water (Schnelle Bestimmung Gammastrahlender Radionuklide in Wassern),
W72-09445 5A

Migration and Leaching of Metals from Old Mine Tailings Deposits,
W72-09620 5B

Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

The Santa Barbara Oil Spill Part 1: Initial Quantities and Distribution of Pollutant Crude Oil,
W72-09682 5B

WATER POLLUTION TREATMENT

Dynamics of Contained Oil Slicks,
W72-09258 5G

WATER PROPERTIES

Kinetics of OH Radical Reactions in Irradiated Ordinary and Supercooled Water,
W72-09428 5B

WATER QUALITY

The Nation's Rivers,
W72-09188 5G

Systems Analysis for Water Quality Management - Survey and Abstracts.
W72-09229 5G

Geology and Ground-Water Resources of Northwestern North Carolina,
W72-09264 4B

Availability of Ground Water for Public-Water Supply in the Pensacola Area, Florida,
W72-09267 4B

Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

Algal Influences on Dieoff Rates of Indicator Bacteria,
W72-09590 5D

Annotated Bibliography of Publications on Watershed Management by the Southeastern Forest Experiment Station, 1928-1970,
W72-09603 3B

Getting Representative Water Samples,
W72-09672 5A

Measurement and Control of Particulate Matter in Filter Effluents,
W72-09693 5F

Research on Algal Odor,
W72-09694 5F

Water Quality Records of the Snowy Mountains Region, Australia.
W72-09770 7C

WATER QUALITY ACT

Public Regulation of Water Quality in the United States,
W72-09527 5G

WATER QUALITY CONTROL

Optimal Search for Pollution Sources,
W72-09232 5B

Algae Control by Mixing, Staff Report on Kezar Lake in Sutton, N.H.
W72-09304 5G

The Potential Contribution of Desalting to Future Water Supply in New Mexico,
W72-09306 3A

Mathematical Model for Fate of Pollutants in Near-Shore Waters,
W72-09377 5B

Dequeen Lake, Rolling Fork River, Arkansas (Draft Environmental Impact Statement).
W72-09462 8D

Problems in Water Toxicology (Voprosy vodnoy toksikologii).
W72-09646 5C

Present State and Development of Scientific Research on Prevention of Fishery Pollution (Sostoyaniye i perspektivy nauchno-issledovatel'skikh rabot po probleme okhrany rybokhozyaystvennykh vodoyemov ot zagryazneniya),
W72-09648 5C

Water Quality Control in Oregon.
W72-09669 5G

Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

WATER QUALITY STANDARDS

Present State and Development of Scientific Research on Prevention of Fishery Pollution (Sostoyaniye i perspektivy nauchno-issledovatel'skikh rabot po probleme okhrany rybokhozyaystvennykh vodoyemov ot zagryazneniya),
W72-09648 5C

Water Quality Control in Oregon.
W72-09669 5G

WATER RECOVERY

Interceptor Drain Recovery of Canal Seepage,
W72-09197 8A

WATER REQUIREMENTS

Estimating Soil Moisture Depletion from Climate, Crop and Soil Data,
W72-09223 2G

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

WATER RESOURCES

Water Resources Investigations in Louisiana, 1968.
W72-09225 7C

Water Resources Investigations in Iowa, 1968.
W72-09226 7C

Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

WATER RESOURCES

Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

The Westwide Water Study,
W72-09701 6B

Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

Water Resources Investigations in Missouri, 1968.
W72-09766 7C

Water Resources Investigations in New Jersey, 1968.
W72-09767 7C

Water Resources Investigations in Minnesota, 1969.
W72-09768 7C

Geologic and Hydrologic Study of Northern Sardinia: Report Number 3. The Provision of Water for the Region of Anglona, (In Italian),
W72-09781 6D

WATER RESOURCES DEVELOPMENT

Status of Weather Modification in Watershed Management,
W72-09189 3B

A Water Planning Concept for the State of Washington.
W72-09308 6D

Extending the Utility of Non-Urban Water Supplies,
W72-09525 6B

The Westwide Water Study,
W72-09701 6B

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

WATER RESOURCES INSTITUTE

Water Resources Research in Virginia, Annual Report for Fiscal Year 1971.
W72-09199 9D

The Rhode Island Water Resources Research Program, Seventh Annual Report.
W72-09200 9D

WATER RESOURCES PLANNING ACT

Coordination Directory for Planning Studies and Reports, August 1971.
W72-09273 6E

WATER RESOURCES RESEARCH ACT

Water Resources Research in Virginia, Annual Report for Fiscal Year 1971.
W72-09199 9D

WATER RESOURCES RESEARCH (VA)

Water Resources Research in Virginia, Annual Report for Fiscal Year 1971.
W72-09199 9D

WATER REUSE

Basin Management for Water Reuse.
W72-09381 5D

The Use of Sewage Effluent at South African Pulp and Paper Industries' Enstra Bleached Kraft Mill,
W72-09399 5D

Methods for Clean Condensation of Atmospheric Moisture for Its Use in a Closed Ecological System,
W72-09583 5D

The Treatment of Industrial Wastewater for Reuse--Chrysler Indianapolis Foundry,
W72-09600 5D

Arctic Waste Management,
W72-09601 5D

WATER SAMPLING

Water Pollution Monitoring Stations: An Ounce of Prevention,
W72-09374 5A

WATER SOURCES

Annotated Bibliography of Publications on Watershed Management by the Southeastern Forest Experiment Station, 1928-1970,
W72-09603 3B

WATER SUPPLY

Rate Philosophy,
W72-09142 6C

Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

Water and Land Resources, Ouachita River Basin in Arkansas,
W72-09309 6D

Extending the Utility of Non-Urban Water Supplies,
W72-09525 6B

Electrical Analog Model Study of Water in Guayama Area, Puerto Rico: Phase 1 -- Assembling Data for the Analog Model,
W72-09543 2F

WATER SUPPLY DEVELOPMENT

The Fountains of Rome,
W72-09380 8A

Tallulah Creek Watershed (Long Creek Portion), North Carolina (Draft Environmental Impact Statement).
W72-09475 8A

WATER TABLE

Beach Water Table and Beach-Profile Measuring Equipment,
W72-09758 7B

WATER TEMPERATURE

Stream Temperature Prediction Under Reduced Flow,
W72-09259 4A

Temperature and Flow Conditions During the Formation of River Ice,
W72-09631 2C

Catches of Postlarval White Shrimp, 'Penaeus setiferus' (Linn.), and Brown Shrimp, P. aztecus ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967,
W72-09674 2L

The Effect of Temperature on the Feeding Rate and Behavior of the Caddisfly Hydropsyche frisoni,
W72-09686 5C

Mathematical Models for the Prediction of Thermal Energy Changes in Impoundments.
W72-09727 5B

Research on the Physical Aspects of Thermal Pollution.
W72-09728 5B

An Analytical and Experimental Investigation of Surface Discharges of Heated Water,
W72-09729 5B

Heat Dissipation at Power Plant Cooling Lakes,
W72-09736 2D

Hazelwood Power Station - Data Collection and Analysis of Cooling Pond Performance,
W72-09737 5D

Water Temperatures of California Streams, South Coastal Subregion,
W72-09755 2E

WATER TEMPERATURE FORECASTING

Research on the Physical Aspects of Thermal Pollution.
W72-09728 5B

WATER TESTING

Testing New Sewer Pipe Installations,
W72-09595 5D

WATER TREATMENT

Aeration Systems for Large Navigable Rivers,
W72-09196 5G

Water Treatment Plant Staging Policy,
W72-09289 5F

Basin Management for Water Reuse.
W72-09381 5D

Magnesium Carbonate, A Recycled Coagulant for Water Treatment.
W72-09387 5F

Crystal Seed Conditioning of Calcium Carbonate Sludge,
W72-09392 5F

Filtration of Water and Wastewater,
W72-09393 5D

Understanding Turbidity Measurement,
W72-09671 5F

Mechanism of Hydrogen Ion Buffering in Natural Waters,
W72-09687 5F

Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

The Application to Existing Plant of Recent Developments in Water Filtration,
W72-09689 5F

The Ozonization of Turret and Other Scottish Waters,
W72-09690 5F

Use of Acid-Treated Sodium Silicate in Coagulation,
W72-09691 5F

Decontamination of Radioactive Aqueous Effluent by the Calcium-Ferric Phosphate Process,
W72-09692 5F

Measurement and Control of Particulate Matter in Filter Effluents,
W72-09693 5F

Research on Algal Odor,
W72-09694 5F

Stoichiometry of the Coagulation of Color-Causing Organic Compounds with Ferric Sulfate,
W72-09695 5F

Studies on Actinomycetes and Their Odors,
W72-09696 5F

WATER TYPES
Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

WATER UTILIZATION
Problems in the Utilization of Water Resources (Problemy ispol'zovaniya vodnykh resursov).
W72-09644 8B

Potential Uses of Waste Waters and Heated Effluents,
W72-09733 5B

The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

WATER WELLS
Geology and Ground-Water Resources of Northwestern North Carolina,
W72-09264 4B

Availability of Ground Water for Public-Water Supply in the Pensacola Area, Florida,
W72-09267 4B

Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

Electrical Analog Model Study of Water in Guayama Area, Puerto Rico: Phase 1 -- Assembling Data for the Analog Model,
W72-09543 2F

Ground-Water Resources of Cache Valley, Utah and Idaho,
W72-09558 4B

Ground-Water Levels in the Lower Arkansas River Valley of Colorado, 1968-72.
W72-09559 4B

Use of Groundwater for Irrigation in Clay County, Nebraska, 1970,
W72-09756 4B

Ground-Water Hydraulics,
W72-09769 2F

WATER YIELD
Geology and Ground-Water Resources of Northwestern North Carolina,
W72-09264 4B

Availability of Ground Water for Public-Water Supply in the Pensacola Area, Florida,
W72-09267 4B

Rural Water Supply in the Basement Complex of Western State, Nigeria,
W72-09275 3B

Annotated Bibliography of Publications on Watershed Management by the Southeastern Forest Experiment Station, 1928-1970,
W72-09603 3B

Ground-Water Hydraulics,
W72-09769 2F

WATER YIELD IMPROVEMENT
Chaparral Treatment Effects on Streamflow,
W72-09604 3B

WATERSHED MANAGEMENT
Status of Weather Modification in Watershed Management,
W72-09189 3B

Annotated Bibliography of Publications on Watershed Management by the Southeastern Forest Experiment Station, 1928-1970,
W72-09603 3B

WATERSHEDS
Ecological Dynamics of Watersheds,
W72-09565 2A

WATERSHEDS (BASINS)
Tallulah Creek Watershed (Long Creek Portion), North Carolina (Draft Environmental Impact Statement).
W72-09475 8A

Hitson, C and L and Washburn Draws, Watershed, Texas (Draft Environmental Impact Statements).
W72-09476 4B

WATERTIGHT
Testing New Sewer Pipe Installations,
W72-09595 5D

WAVES (WATER)
Asymptotic Theory of Helical Waves on a Gaseous Jet in a Rotating Viscous Fluid,
W72-09237 2E

Determination of the Zone of Origin of Tsunamis (Opredeleniye mesta vozniknoveniya tsunami),
W72-09280 2L

The Approximate Theories of Pneumatic Wave Generators,
W72-09541 8B

WEATHER DATA
Eyewitness Tornado Observations Obtained with Telephone and Tape Recorder,
W72-09217 2B

WEATHER FORECASTING
Deuterium Content of Snow as an Index to Winter Climate in the Sierra Nevada Area,
W72-09622 2C

WEATHER MODIFICATION
Some Economic Aspects of Rain Stimulation,
W72-09146 3B

Status of Weather Modification in Watershed Management,
W72-09189 3B

The Seeding of Ice Saturated Layers in the Atmosphere: A Computational Study,
W72-09207 2B

WEIGHT
More Accurate Gas-Chromatographic Analysis Using Flame-Ionization Detector,
W72-09373 5A

WESTERN DVINA RIVER
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

WESTWIDE WATER STUDY
The Westwide Water Study,
W72-09701 6B

WETLANDS
Water Budget Analysis of a New England Wetland,
W72-09265 3B

WHEY
Membrane Processing of Cottage Cheese Whey for Pollution Abatement.
W72-09385 5D

WIND TUNNELS
Large Vertical Wind Tunnel for Hydrometeor Studies,
W72-09210 2B

WINDS
Vertical Profiles of Windspeed in a Pine Stand,
W72-09609 2I

An Inexpensive Heated Thermistor Anemometer,
W72-09610 2D

YAKUTSK ASSR
New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

YAQUINA BAY (ORE)
Salinity, Runoff and Wind Measurements, Yaquina Estuary, Oregon,
W72-09554 5C

YAROSLAVL' OBLAST
Geologic Age of Ancient Lake Sediments of the MologoSheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

YIELD
Perennial Grass Mixtures for Hay-Pasture Use of Low-Productive and Eroded Lands Under Dry Farming Conditions, (In Bulgarian),
W72-09772 3F

ZEOLITES
Wastewater Ammonia Removal by Ion Exchange.
W72-09383 5D

ZINC
Determination of Copper, Iron, and Zinc From a Single Small Sample,
W72-09243 5A

Voltammetric Measurement of Zinc in the Northeastern Tropical Pacific Ocean,
W72-09413 5A

Radioactive and Metallic (Copper and Zinc) Pollutants in the Scheldt Estuary (in Water, Sediment and Suspended Matter), (Les Polluants Radioactifs et Metalliques (Cuivre et Zinc) dans L'Estuaire De L'Escaut (Eaux, Sediments et Matieres en Suspension)),
W72-09455 5A

The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis Macrochirus raf.),
W72-09679 5C

Zinc Retention in Young Rats Fed Increasing Levels of High-Zinc Oysters,
W72-09716 5C

ZINC METABOLISM
Zinc Retention in Young Rats Fed Increasing Levels of High-Zinc Oysters,
W72-09716 5C

ZONE OF INFLUENCE
Biological Factors in Aerator Performance,
W72-09602 5D

ZOOPLANKTON
Contribution of the Study of Zooplankton in Lebanese Waters, (Contribution A L' Etude Du Zooplancton Des Eaux Libanaises),
W72-09355 5A

AUTHOR INDEX

ADAIR, F. W.
Effect of a Hostile Environment on Pseudomonas aeruginosa,
W72-09244 5C

AKYEAMPONG, Y. A.
Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

ALAMANNI, U.
Geologic and Hydrologic Study of Northern Sardinia: Report Number 3. The Provision of Water for the Region of Anglona, (In Italian),
W72-09781 6D

ALEKSANDRYAN, G. A.
Atmospheric Precipitation in the Armenian SSR (Atmosfernyye osadki v Armyanskoy SSR),
W72-09746 2B

ALLEN, H.
Effects of Petroleum Fractions on the Early Development of a Sea Urchin,
W72-09677 5C

ALLEN, H. L.
Phytoplankton Photosynthesis, Micronutrient Interactions, and Inorganic Carbon Availability in a Soft-Water Vermont Lake,
W72-09160 5C

ALLEN, R. D.
Taxonomy of Marine Bacteria: Beneckea nigrapulchrituda Sp. N.,
W72-09241 5A

ALTER, A. J.
Arctic Waste Management,
W72-09601 5D

ANDERSON, D. J.
Pattern in Desert Perennials,
W72-09333 2I

ANDERSON, G. W.
Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

ANDERSON, J. U.
Land Classification for Irrigation, Roosevelt County,
W72-09663 3F

Land Classification for Irrigation, Torrance County,
W72-09664 3F

Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

ANDERSON, N. H.
Emergence Trap Collections of Trichoptera from an Oregon Stream,
W72-09571 5A

ANDERSON, P. W.
Occurrence and Distribution of Trace Elements in New Jersey Streams,
W72-09545 5A

ANDREWS, R. G.
Water and Land Resources, Ouachita River Basin in Arkansas,
W72-09309 6D

ANSPAUGH, L. A.
Sampling and Analytical Systems for Measuring Environmental Radioactivity,
W72-09453 5A

ANSPAUGH, L. R.
Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

ARENA, J. R.
The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

ARNDT, J.
Rapid Determination of Gamma-Ray Emitting Radionuclides in Water (Schnelle Bestimmung Gammastrahlender Radionuklide in Wassern),
W72-09445 5A

ARSLANOV, KH. A.
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

ASKEW, M. W.
Multi-Stage Plastic Media Treatment Plants,
W72-09598 5D

ASSEEZ, L. O.
Rural Water Supply in the Basement Complex of Western State, Nigeria,
W72-09275 3B

ATANASOV, P.
On The Minimal Soil Tillage In Growing Maize Under Irrigation, (In Bulgarian),
W72-09753 3F

AYRES, R. U.
Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

BAHNICK, D. A.
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

BAHNS, T. K.
The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis Macrochirus raf.),
W72-09679 5C

BAKER, J. K.
Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

BAKKER, L.
Floating Oil Containment Apparatus,
W72-09508 5G

BALDEN, A. R.
The Treatment of Industrial Wastewater for Reuse--Chrysler Indianapolis Foundry,
W72-09600 5D

BALLESTRA, S.
A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

BALLMAN, W. B.
Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

BARABANOV, L. N.
Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

BARBER, F. G.
On the Water of the Canadian Arctic Archipelago, an Atlas Presentation of 1961 and 1962 Data,
W72-09227 7C

BARK, L. S.
Analysis of Small Quantities of Saccharides in Aqueous Effluents,
W72-09419 5A

BARKLEY, W. A.
Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

BARNETT, J. T. JR
The Interrelation of Carbon and Phosphorus in Regulating Heterotrophic and Autotrophic Populations in an Aquatic Ecosystem, Shriner's Pond,
W72-09159 5C

BARRATT, R. S.
The Determination of Traces of Nickel by Gas-Liquid Chromatography,
W72-09369 5A

BARRETO, E.
Submicroscopic Aerosols from Electrically Stressed Water Surfaces,
W72-09214 2B

BASSETT, D. L.
Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

BATCH, D. L.
Stream Capture in Kentucky Indicated by Distributional Records of Fundulus catenatus and etheostoma spectabile,
W72-09252 4A

BATHKE, W. L.
The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

BAUMANN, L.
Taxonomy of Marine Bacteria: Beneckea nigrapulchrituda Sp. N.,
W72-09241 5A

BAUMANN, P.
Taxonomy of Marine Bacteria: Beneckea nigrapulchrituda Sp. N.,
W72-09241 5A

BAUMGARTNER, D. J.
Disposal of Solid Aluminum Process Wastes in the Ocean,
W72-09552 5C

BAYLIS, J. R.
Use of Acid-Treated Sodium Silicate in Coagulation,
W72-09691 5F

BECK, J. V.
Chalcocite Oxidation and Coupled Carbon Dioxide Fixation by Thiobacillus Ferrooxidans,
W72-09359 5C

BEESLEY, J. A.
Rights and Responsibilities of Arctic Coastal States: The Canadian View,
W72-09465 6E

BEHNKE, R. J.
Trouts of the Upper Kern River Basin, California, with Reference to Systematics and Evolution of Western North American Salmo,
W72-09515 2E

BELCHER, R.
The Determination of Traces of Nickel by Gas-Liquid Chromatography,
W72-09369 5A

BELL, G. R.
MBF Pilot Plant Filtration of Combined Municipal and Paper Mill Waste,
W72-09301 5D

BELOFF, A.
The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

BELONJE, B.
Zinc Retention in Young Rats Fed Increasing Levels of High-Zinc Oysters,
W72-09716 5C

BENEDICHUK, N. F.
Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

BENNET, E. R.
Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

BENNETT, H. A.
Biochemical Process,
W72-09502 5D

BENTALL, R.
Water supplies and the Land--The Elkhorn River Basin of Nebraska,
W72-09557 7C

BENTON, J. H.
Multi-Stage Plastic Media Treatment Plants,
W72-09598 5D

BERGEN, J. D.
An Inexpensive Heated Thermistor Anemometer,
W72-09610 2D

The Relation of Snow Transparency to Density and Air Permeability in a Natural Snow Cover,
W72-09607 2C

Topographic Effects Apparent in Nocturnal Temperature Profiles in a Conifer Canopy,
W72-09608 2D

Vertical Profiles of Windspeed in a Pine Stand,
W72-09609 2I

BIANCHI, A. J. M.
Distribution of Certain Heterotrophic Aerobic Bacteria in Eastern Mediterranean Deep-Sea Sediments, (Distribution De Certaines Bacteries Heterotrophes Aerobied Dans Les Sediments Profonds De Mediterranee Orientale),
W72-09349 5C

BISHOP, A. W.
A New Ring Shear Apparatus and its Application to the Measurement of Residual Strength,
W72-09706 8D

BISSELLE, C. A.
Monitoring the Environment of the Nation,
W72-09230 6G

BJORKLUND, L. J.
Ground-Water Resources of Cache Valley, Utah and Idaho,
W72-09558 4B

BLACK, A. P.
Stoichiometry of the Coagulation of Color-Causing Organic Compounds with Ferric Sulfate,
W72-09695 5F

BLAKELEY, R. W. G.
Seismic Resistance of Prestressed Concrete Beam-Column Assemblies,
W72-09713 8F

BLANCHARD, D. C.
Experiments on the Generation of Raindrop-Size Distributions by Drop Breakup,
W72-09203 2B

Structure and Modification of Clouds and Fogs,
W72-09201 2B

BLASEWITZ, A. G.
Present Status of the U.S. Program on the Solidification of High Level Wastes,
W72-09584 5D

BLAZEVIC, D. J.
Nucleic Acid Enzyme Studies of Nonfermentative Gram-Negative Bacteria Using Thin-Layer Chromatography,
W72-09408 5A

BLODGETT, J. C.
Water Temperatures of California Streams, South Coastal Subregion,
W72-09755 2E

BLOMSTRAND, R.
Improved Continuous Radio Gas Chromatography of Hydrogen-3-- and Carbon-14--Labelled Compounds Using Hydrocracking,
W72-09352 5A

BLOOM, S. A.
Animal-Sediment Relations and Community Analysis of a Florida Estuary,
W72-09177 5C

BOELTER, D. H.
Water Table Drawdown Around an Open Ditch in Organic Soils,
W72-09268 4A

BOGEN, D. C.
Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

BOLAND, R. A. JR
Flushing Studies, Victorial Channel, Victoria, Texas: Hydraulic Model Investigation,
W72-09761 8B

BOLES, A. J.
Interceptor Drain Recovery of Canal Seepage,
W72-09197 8A

BONDERMAN, D. P.
Appearance of 1-Hydroxychlordene in Soil, Crops, and Fish,
W72-09317 5A

BOON, J. D. III
Beach Water Table and Beach-Profile Measuring Equipment,
W72-09758 7B

BOUCHER, F. R.
Adsorption of Lindane and Dieldrin Pesticides on Unconsolidated Aquifer Sands,
W72-09539 5B

BOUWER, H.
Interceptor Drain Recovery of Canal Seepage,
W72-09197 8A

BRADLEY, J. R. JR
Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

BRADSHAW, T. T.
Closing Circle on Environmental Economics,
W72-09144 6E

BRADY, D. K.
The Dissipation of Heat from Thermal Discharges,
W72-09732 5B

Heat Dissipation at Power Plant Cooling Lakes,
W72-09736 2D

BRAGINSKIY, L. P.
Problem of Pesticides in Water Toxicology (Problema pestitsidov v vodnoy toksikologii),
W72-09650 5C

BRAMER, H. C.
Magnetic Flocculation of Steel Mill Waste Waters,
W72-09585 5D

BRANICA, M.
Polarography of Seawater II. Complex Formation of Cadmium with EDTA,
W72-09673 5A

BRANSON, B. A.
Stream Capture in Kentucky Indicated by Distributional Records of Fundulus catenatus and etheostoma spectabile,
W72-09252 4A

BRERETON, A. J.
The Structure of the Species Populations in the Initial Stages of Salt-Marsh Succession,
W72-09288 4A

BRETHERICK, L.
Boom for Oil Spilt on Water,
W72-09495 5G

BRETTHAUR, E. W.
Monitoring of Tritium Under Emergency Conditions,
W72-09443 5A

BREWER, P. L.
The Determination of Oil-Soluble Sulphonates by Two-Phase Titration,
W72-09375 5A

BREZONIK, P. L.
Nitrogen Fixation by Bacteria in Lake Mize, Florida, and in Some Lacustrine Sediments,
W72-09579 5C

BRICE, R. M.
Algal Responses to Nutrient Additions in Natural Waters. II. Field Experiments,
W72-09165 5C

BRINKMAN, J. J.
Treatment of Sewage Digester Supernatant Liquor,
W72-09488 5D

BROCKWAY, D. L.
The Interrelation of Carbon and Phosphorus in Regulating Heterotrophic and Autotrophic Populations in an Aquatic Ecosystem, Shriner's Pond,
W72-09159 5C

BROMAN, C.
The Operation of Pressure Type Sand Filters for Hot Mill Waste Waters,
W72-09587 5D

BROOKS, W. L.
Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

BRUTON, J. D. JR
Operation of a Central Waste Treatment System-Bayport Industrial Complex,
W72-09586 5D

BRYANT, D. R.
Burner Memory Following Atomic Absorption Spectrophotometric Analysis of Moderately Volatile Organometallic Complexes,
W72-09247 5A

BRYANT, P. M.
The Nuclear Power Industry's Need for Rapid and Accurate Estimation of Radioactivity in the Environment,
W72-09438 5A

BUMBU, YA. V.
Biogeochemical Sources of Iodine and Cobalt in Moldavia (Biogeokhimicheskiye provintsii yoda i kobalta v Moldavii),
W72-09643 2K

BURDICK, G. E.
A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

BURKE, J. A.
A Method for the Analysis of Fish, Animal, and Pultry Tissue for Chlorinated Pesticide Residues,
W72-09684 5A

Micro Scale Alkali Treatment for use in Pesticide Residue Confirmation and Sample Cleanup,
W72-09314 5A

BURTON, D. T.
The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis Macrochirus raf.),
W72-09679 5C

BUSCH, A. W.
Biological Factors in Aerator Performance,
W72-09602 5D

BUTCHBAKER, A. F.
Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

BUTCHER, W. R.
Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

BYKHOVSKIY, L. Z.
New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

BYRNE, A. R.
The Toluene Extraction of Some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part 1. Extraction Behaviour of As, Au, Bi, Br, Cd, Cu, Ga, Ge, In, Hg, Mo, Pb, Sb, Se, Sn, W and Zn,
W72-09367 5A

The Toluene Extraction of some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part II. Determination of Arsenic and Antimony in Biological Materials at Sv bmicrogram Levels,
W72-09368 5A

CAHN, R. P.
Removal of Inorganic Species by Liquid Membrane,
W72-09497 5D

CAILLOUET, C. W. JR
Catches of Postlarval White Shrimp, 'Penaeus setiferus' (Linn.), and Brown Shrimp, P. aztecus ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967,
W72-09674 2L

CAIRNS, J. J.
The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis Macrochirus raf.),
W72-09679 5C

CALLAHAN, J. T.
The Role of the U.S. Geological Survey in Waste Disposal Monitoring,
W72-09616 5B

CALLAWAY, R. J.
Applications of Some Numerical Models to Pacific Northwest Estuaries,
W72-09549 5B

Salinity, Runoff and Wind Measurements, Yaquina Estuary, Oregon,
W72-09554 5C

CALLOWAY, R. J.
Disposal of Solid Aluminum Process Wastes in the Ocean,
W72-09552 5C

CAMBRAY, R. S.
Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

CAMIN, K. Q.
Cost of Waste Treatment in the Meat Packing Industry,
W72-09397 5D

CAMPBELL, R. M.
The Ozonization of Turret and Other Scottish Waters,
W72-09690 5F

CANELLI, E.
Characterization of Phosphorus-Limited Plankton Algae,
W72-09163 5C

CAPITOLI, R.
Malacological Resources of the Gulf of San Matias with some Observations made in the Exploratory Campaign SAO-I-71,
W72-09708 2L

CAREL, A. B.
The Analysis of Nitrogen Containing Polymeric Ashless Oil Dispersants by Dialysis and Alumina Chromatography,
W72-09376 5A

CARLSON, E. J.
Drainage from Level and Sloping Land,
W72-09698 8B

CARMACK, G.
Coated Wire Ion Selective Electrodes,
W72-09324 2K

CARMACK, G. P.
Role of Solvent Extraction Parameters in Liquid Membrane Ion Selective Electrodes,
W72-09325 2K

CARSTENS, T.
Heat Exchanges and Frazil Formation,
W72-09633 2C

CARTER, M. W.
Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

Monitoring of Tritium Under Emergency Conditions,
W72-09443 5A

CATON, G. M.
Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

CHAN, L. K.
Best Linear Unbiased Estimates of the Parameters of the Logistic Distribution Based on Selected Order Statistics,
W72-09348 7C

CHAN, N. N.
Best Linear Unbiased Estimates of the Parameters of the Logistic Distribution Based on Selected Order Statistics,
W72-09348 7C

CHAPMAN, D. G.
Ecological Dynamics of Watersheds,
W72-09565 2A

CHARBONNEAU, R.
Hydro-Physiographic Model,
W72-09234 6A

CHARNELL, R. L.
Infill of Nuclear Rubble Chimneys by Ground Water,
W72-09617 4B

CHARTERS, A. C.
The Santa Barbara Oil Spill Part 1: Initial Quantities and Distribution of Pollutant Crude Oil,
W72-09682 5B

CHAU, A. S. Y.
Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

CHEN, G. K.
Computer Software for Wastewater Treatment Plant Design,
W72-09233 5D

CHEN, M.
Characterization of Phosphorus-Limited Plankton Algae,
W72-09163 5C

CHINN, S. S. W.
Reconnaissance Study of Sediment Transported by Streams, Island of Oahu,
W72-09759 2J

CHIPPERFIELD, N. J.
Multi-Stage Plastic Media Treatment Plants,
W72-09598 5D

CHIZHOV, S. V.
Methods for Clean Condensation of Atmospheric Moisture for Its Use in a Closed Ecological System,
W72-09583 5D

CHOW, W.
Determination of Carbetamide Residues and its Aniline Metabolite,
W72-09316 5A

CHRISTENSEN, S.
The Determination of Calcium in the 0.1 to 10 NG Region by Atomic Absorption Spectroscopy with the Heated Graphite Atomizer,
W72-09329 5A

CLARK, P. S.
Possible Origin of Clostridium Botulinum Contamination of Eskimo Foods in Northwestern Alaska,
W72-09417 5C

CLARK, S. E.
Arctic Waste Management,
W72-09601 5D

CLARKE, L. D.
The Mangrove Swamp and Salt Marsh Communities of the Sydney District. IV. The Significance of Species Interaction,
W72-09286 2L

CLAYTON, J. L.
Salt Spray and Mineral Cycling in Two California Coastal Ecosystems,
W72-09605 2K

CLEAVELAND, G. W.
Field Tests of the 345 KV Series Compensated Glen Canyon-Pinnacle Peak Transmission Lines--Colorado River Storage Project,
W72-09192 8C

Portable Surge Counters Check Phase-to-Phase Surge Levels Between 115-KV Power Transformer Bushings at Blue Mesa Powerplant--Colorado River Storage Project,
W72-09187 8C

COLEMAN, A. J.
Floating Breakwater,
W72-09511 4A

COLEMAN, R. L.
A Modified Delves Cup Atomic Absorption Procedure for the Determination of Lead in Blood,
W72-09332 5A

CONNELL, D. W.
Kerosene-Like Tainting in Australian Mullet,
W72-09678 5C

CONNER, J. R.
A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

CONRADIE, P. J.
The Use of Sewage Effluent at South African Pulp and Paper Industries' Enstra Bleached Kraft Mill,
W72-09399 5D

COOK, E. E.
Organic Concentration and Hydraulic Loading Versus Organic Loading in Evaluation of Trickling Filter Performance,
W72-09596 5D

COOPER, R. L.
Analysis of Small Quantities of Saccharides in Aqueous Effluents,
W72-09419 5A

COPELAND, B. J.
Phosphorus and Eutrophication in the Pamlico River Estuary, N. C., 1966-1969 - A Summary,
W72-09655 5C

COPELAND, G. G.
The Clarification of Paper Mill Effluents by Activated Carbon Produced from Waste Sulfite Liquor and Other Refuse,
W72-09589 5D

CORDON, T. C.
The Biodegradation of Some Sulfated Alkanolamides,
W72-09344 5B

COUTANT, C. C.
Methods for Evaluating Effects of Transient Conditions in Heavily Loaded and Extensively Regulated Streams,
W72-09731 5B

COX, J. L.
Uptake, Assimilation, and Loss of DDT Residues by Euphausia pacifica, A Euphausid Shrimp,
W72-09519 5C

CROSBY, A. B.
Grouting Preplaced Aggregate to Form Concrete,
W72-09190 8F

CROSBY, J. W.
Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

CROSBY, R. M.
A Three-Dimensional Current Meter for Estuarine Applications,
W72-09334 2L

CSERJESI, A. J.
Methylation of Pentachlorophenol by Trichoderma Virgatum,
W72-09562 5B

CUDNEY, R. A.
An Optical Lightning Detector,
W72-09208 2B

Point Discharge Current in Blackwell, Oklahoma, June 1969 - September 1970,
W72-09218 2B

Structure and Modification of Clouds and Fogs,
W72-09201 2B

CULP, G.
Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

CUMMINS, K. W.
Energetics of Natural Populations of Freshwater Macroconsumers,
W72-09666 5C

CUTCHIN, D. L.
Salinity, Runoff and Wind Measurements, Yaquina Estuary, Oregon,
W72-09554 5C

DACRE, J. C.
Possible DDT Mortality in Young Rainbow Trout,
W72-09141 5C

DANCE, E. L.
Development of Cellulose Triacetate Hollow Fiber Reverse Osmosis Modules for Brackish Water Desalination,
W72-09517 3A

DANIELS, D. G.
Remote Sensing Acquisition of Tracer Dye and Infrared Imagery Information and Interpretation for Industrial Discharge Management,
W72-09550 5B

D'ARGE, R. C.
Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

DAVIS, E. M.
Algal Influences on Dieoff Rates of Indicator Bacteria,
W72-09590 5D

DAVIS, R. M.
Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

DAVIS, T. E.
Development of Cellulose Triacetate Hollow Fiber Reverse Osmosis Modules for Brackish Water Desalination,
W72-09517 3A

DAWSON, P. S. S.
Continuously Synchronised Growth,
W72-09340 5C

DAY, E. K.
Arctic Waste Management,
W72-09601 5D

DE LA MORINIERE, T. C.
Bomex Temporary Archive Description of Available Data,
W72-09263 7C

DEBEN, W. A.
Design and Construction of a Saltwater Environment Simulator,
W72-09553 5C

DEBRUYNE, J.
Mycobacteria of Sewage Water and Sediment, (In French),
W72-09777 5A

DECKER, J. A. JR
Hadamard-Transform Spectrometry: A New Analytical Technique,
W72-09418 2K

DEE, N.
Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

DEEVEY, E. S. JR
Biogeochemistry of Lakes: Major Substances,
W72-09157 5C

DEMMERLE, S. D.
Characterization of Phosphorus-Limited Plankton Algae,
W72-09163 5C

DENCE, C. W.
The Characteristics of Residues in Spent Chlorination Liquor,
W72-09592 5D

DEPUY, G. W.
New Techniques for Quality Control of Concrete,
W72-09712 8F

DERSE, P. H.
Natural Carbon Sources, Rates of Replenishment, and Algal Growth,
W72-09168 5C

DESHMUKH, D. S.
Zinc Retention in Young Rats Fed Increasing Levels of High-Zinc Oysters,
W72-09716 5C

DESTY, D. H.
Boom for Oil Spilt on Water,
W72-09495 5G

DETTORI, B.
Geologic and Hydrologic Study of Northern Sardinia: Report Number 3. The Provision of Water for the Region of Anglona, (In Italian),
W72-09781 6D

DEVROY, D. J.
Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

DIAZ, J. R.
Electrical Analog Model Study of Water in Guayama Area, Puerto Rico: Phase 1 -- Assembling Data for the Analog Model,
W72-09543 2F

DICKAS, A. B.
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

DICKENSON, R. L.
Stabilization of Refinery Waste Water with the Activated Sludge Process: Determination of Design Parameters,
W72-09593 5D

DICKSON, K. L.
The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis Macrochirus raf.),
W72-09679 5C

DIETZ, D. N.
Oil Spill Removal Method,
W72-09510 5G

DISLER, V. N.
Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

DITSWORTH, G. R.
Disposal of Solid Aluminum Process Wastes in the Ocean,
W72-09552 5C

Salinity, Runoff and Wind Measurements, Yaquina Estuary, Oregon,
W72-09554 5C

DOLGOPOL'SKAYA, M. A.
Experimental Study of the Fouling Process at Sea,
W72-09564 5A

DOUGLASS, J. E.
Annotated Bibliography of Publications on Watershed Management by the Southeastern Forest Experiment Station, 1928-1970,
W72-09603 3B

DOZA, GEORGE
Thin Layer Chromatography and Infra-Red and Ultra-Violet Spectra of Fenthion and Seven of its Degradation Products,
W72-09182 5A

DREGNE, H. E.
Land Classification for Irrigation, Roosevelt County,
W72-09663 3F

DROBNY, N. L.
Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

DROZDOV, O. A.
Long-Term Cyclic Fluctuations of Atmospheric Precipitation in the USSR (Mnogoletniye tsiklicheskiye kolebaniya atmosfernykh osadkov na territorii SSSR),
W72-09747 2B

DUBYNE, F. T.
Handling Waste Disposal at a Major Food Plant,
W72-09591 5D

DUGAS, R. J.
Catches of Postlarval White Shrimp, 'Penaeus setiferus' (Linn.), and Brown Shrimp, P. aztecus ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967,
W72-09674 2L

DUKE, K. M.
Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

DUNSETH, M. G.
Treatment of Sewage Digester Supernatant Liquor,
W72-09488 5D

DUNSTAN, W. M.
Controlled Eutrophication-Increasing Food Production from the Sea by Recycling Human Wastes,
W72-09378 5G

DUTHIE, J. R.
Detergents: Nutrient Considerations and Total Assessment,
W72-09169 5C

DUTTON, J. W. R.
Rapid Methods for Specific Radionuclide Analysis and their Application to Aquatic Emergency Conditions,
W72-09457 5A

EDIGER, R. D.
A Modified Delves Cup Atomic Absorption Procedure for the Determination of Lead in Blood,
W72-09332 5A

EDMONDSON, W. T.
Nutrients and Phytoplankton in Lake Washington,
W72-09167 5C

EGAMBERDIEV, A. M.
Effects of Water Deficiency on Transfer of Assimilates From Leaves Into Fruit Organs of Cotton, (In Russian),
W72-09776 3F

EHRENBERG, L.
Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

ELIASON, J. R.
Remote Sensing Acquisition of Tracer Dye and Infrared Imagery Information and Interpretation for Industrial Discharge Management,
W72-09550 5B

ENGELKEMEIR, A. G.
Variations of Sulfur Isotope Ratios in Samples of Water and Air near Chicago,
W72-09336 5B

EPPS, J. A.
Soil Stabilization: A Mission Oriented Approach,
W72-09193 8D

ERGASHEV, A.
Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

ERICKSON, L. E.
Computer Software for Wastewater Treatment Plant Design,
W72-09233 5D

ERICKSON, P. R.
The Treatment of Industrial Wastewater for Reuse--Chrysler Indianapolis Foundry,
W72-09600 5D

ESVELT, L. A.
Toxicity Assessment of Treated Municipal Wastewaters,
W72-09582 5D

EVANS, D. R.
Capital and Operating Costs--AWT,
W72-09140 5D

EVERETT, D. A. H.
Design of the Beddington Works of the London Borough of Croydon,
W72-09400 5D

EYAL, E.
Selectivity of Cyclic Polyether Type Liquid Membrane Electrodes,
W72-09415 5A

FAHRINGER, D. C.
Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

FAIRCHILD, W. D.
The Westwide Water Study,
W72-09701 6B

FAN, L. T.
Computer Software for Wastewater Treatment Plant Design,
W72-09233 5D

FAUST, SAMUEL D.
Thin Layer Chromatography and Infra-Red and Ultra-Violet Spectra of Fenthion and Seven of its Degradation Products,
W72-09182 5A

FENN, W. O.
Partial Pressure of Gases Dissolved at Great Depth,
W72-09537 1B

FENSKE, P. R.
Infill of Nuclear Rubble Chimneys by Ground Water,
W72-09617 4B

FERNANDEZ, F. J.
The Determination of Lead and Cadmium in Soils and Leaves by Atomic Absorption Spectroscopy,
W72-09331 5A

FIRSOV, L. V.
Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

FISCH, P.
Apparatus to Confine and Recover Oil Spillage at Sea,
W72-09507 5G

FISCO, R. A.
Plating and Industrial Waste Treatment at the Expanded Plant of Fisher Body, Elyria, Ohio,
W72-09594 5D

FISHER, E. M. R.
Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

FISHER, N. S.
Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

FISHMAN, M. J.
Determination of Aluminum in Water,
W72-09330 5A

FLANNAGAN, J. F.
Emergence of Caddisflies (Trichoptera) and Mayflies (Ephemeroptera) from Heming Lake, Manitoba,
W72-09570 5C

FLOODGATE, G. D.
The Seasonal Selection by Temperature of Heterotrophic Bacteria in an Intertidal Sediment,
W72-09350 5C

FOCHTMAN, E. G.
Mathematical Model for Fate of Pollutants in Near-Shore Waters,
W72-09377 5B

FOLKS, J. J.
Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

FOLSOM, T. R.
Cyanide Extraction and Electrodisposition of Trace Amounts of Radioactive Silver From Large Biological Samples,
W72-09246 5A

FONTENOT, B. J. JR
Catches of Postlarval White Shrimp, 'Penaeus setiferus' (Linn.), and Brown Shrimp, P. aztecus ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967,
W72-09674 2L

FOOTE, H. P.
Remote Sensing Acquisition of Tracer Dye and Infrared Imagery Information and Interpretation for Industrial Discharge Management,
W72-09550 5B

FOSTER, M.
The Santa Barbara Oil Spill Part 1: Initial Quantities and Distribution of Pollutant Crude Oil,
W72-09682 5B

The Santa Barbara Oil Spill Part 2: Initial Effects on Intertidal and Kelp Bed Organisms,
W72-09683 5C

FOUDRIAT, D. P.
Apparatus for Reoxygenating a Body of Water,
W72-09503 5G

FOWLER, M. C.
Monitoring the Environment of the Nation,
W72-09230 6G

FRANTSI, C.
Infectious Pancreatic Necrosis Virus: Comparative Frequencies of Isolation From Feces and Organs of Brook Trout (Salvelinus fontinalis),
W72-09152 5A

FREDEEN, F. J. H.
The Temporary Abatement of Nuisance Species of Trichoptera with DDD (TDE) Larvicide,
W72-09412 5C

FREI, R. W.
A Critical study of Some Parameters in Quantitative in situ Investigations of Thin-Layer Chromatography by Light Absorption Methods,
W72-09411 5A

FREISER, H.
Coated Wire Ion Selective Electrodes,
W72-09324 2K

Role of Solvent Extraction Parameters in Liquid Membrane Ion Selective Electrodes,
W72-09325 2K

FREUND, R. J.
A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

FREW, N. M.
Mass Spectrometric Isotope Ratio Measurements and Peak Area Integration using the Peak-Switching Feature of the Aei MS-902,
W72-09326 5A

FREYSTEINSSON, S.
Calculation of Frazil Ice Production,
W72-09629 2C

FRIEDMAN, I.
Deuterium Content of Snow as an Index to Winter Climate in the Sierra Nevada Area,
W72-09622 2C

FROST, C. R.
Decontamination of Radioactive Aqueous Effluent by the Calcium-Ferric Phosphate Process,
W72-09692 5F

FUHS, G. W.
Characterization of Phosphorus-Limited Plankton Algae,
W72-09163 5C

FUKAI, R.
A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

GADD, W. L.
Magnetic Flocculation of Steel Mill Waste Waters,
W72-09585 5D

GALBRAITH, J. H.
Migration and Leaching of Metals from Old Mine Tailings Deposits,
W72-09620 5B

GALLMAN, W. B.
Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

GAMMON, J. R.
Aquatic Life Survey of the Wabash River--With Special Reference to the Effects of Thermal Effluents on Populations of Macroinvertebrates and Fish, 1967-1969,
W72-09725 5C

GARDINER, D. K.
The Determination of Nitrilotriacetic Acid (NTA) In Sewage and Sewage Effluent,
W72-09251 5A

GARDNER, W. H.
Flotation of Solids from Waste Waters,
W72-09496 5D

GARTON, J. E.
Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

GARY, H. L.
Rime Contributes to Water Balance in High-Elevation Aspen Forests,
W72-09613 2C

Seasonal and Diurnal Changes in Moisture Contents and Water Deficits of Engelmann Spruce Needles,
W72-09606 2I

GASEOR, R. A.
The Effect of Temperature on the Feeding Rate and Behavior of the Caddisfly Hydropsyche frisoni,
W72-09686 5C

GASKELL, P.
Pollution: Cleaning up Costs Money,
W72-09461 5G

GATZ, J.
Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

GEFTIC, S. G.
Effect of a Hostile Environment on Pseudomonas aeruginosa,
W72-09244 5C

GEJVALL, T.
Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

GELZER, J.
Effect of a Hostile Environment on Pseudomonas aeruginosa,
W72-09244 5C

GESSNER, F.
The Water Economy of the Sea Grass Thalassia testudinum,
W72-09784 2L

GHASSEMI, M.
Phosphate Precipitation with Ferrous Iron,
W72-09388 5D

GIBBS, C. V.
How Seattle Beat Pollution,
W72-09179 5C

GIBONEY, J. T.
Stabilization of Refinery Waste Water with the Activated Sludge Process: Determination of Design Parameters,
W72-09593 5D

GILBOA, Y.
Groundwater Flow in Calcareous Aquifers in the Vicinity of Barcelona, Spain,
W72-09277 2F

GILLETTE, R.
Stream Channelization: Conflict Between Ditchers, Conservationists,
W72-09538 6E

GILLIGAN, J.
The Relative Importance of Freshwater Input, Temperature and Tidal Range in Determining Levels of Dissolved Oxygen in a Polluted Estuary,
W72-09345 5B

GILLULY, R. H.
Oceans as Alphabet Soup: Focus on DDT and PCB's,
W72-09409 5B

GIORI, C.
Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

GIORV, O. E.
Testing Methods for Concrete Durability,
W72-09702 8F

GIRARD, G.
Hydro-Physiographic Model,
W72-09234 6A

GIRDEN, B.
Method and Apparatus for Desilting and/or Desalting Bodies of Water,
W72-09504 4A

GITERMAN, R. YE.
Geologic Age of Ancient Lake Sediments of the Mologo-Sheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

GLASSEY, C. R.
Optimal Search for Pollution Sources,
W72-09232 5B

GLASSTONE, S.
Public Safety and Underground Nuclear Detonations,
W72-09427 5G

GLENN, J. L.
Studies of Sediment Transport in the Columbia River Estuary,
W72-09551 5B

GLOYNA, E. F.
Algal Influences on Dieoff Rates of Indicator Bacteria,
W72-09590 5D

GODWIN, M. P.
The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

GODWIN, M. R.
Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

GOKHALE, N. R.
Design, Construction and Testing of the Dropsonde,
W72-09211 2B

Estimation of the Occurrence of Hail and Hailstone Sizes,
W72-09206 2B

Experimental Studies of Freezing, Wake Effect, and Breakup of Freely Suspended Supercooled Water Drops,
W72-09204 2B

Large Vertical Wind Tunnel for Hydrometeor Studies,
W72-09210 2B

Theory of Hail Growth,
W72-09205 2B

GOLDMAN, C. R.
The Role of Minor Nutrients in Limiting the Productivity of Aquatic Ecosystems,
W72-09158 5C

GOLDSTEIN, S. N.
Monitoring the Environment of the Nation,
W72-09230 6G

GOODNIGHT, C. J.
The Relationships Between 32P Accumulation in Algae, Bacteria and Tubificids,
W72-09668 5C

GORENC, D.
The Toluene Extraction of Some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part 1. Extraction Behaviour of As, Au, Bi, Br, Cd, Cu, Ga, Ge, In, Hg, Mo, Pb, Sb, Se, Sn, W and Zn,
W72-09367 5A

GORHAM, E.
Penetration of Bog Peats and Lake Sediments by Tritium From Atmospheric Fallout,
W72-09240 5B

GOULDEN, C. A.
Environmental Control of the Abundance and Distribution of the Chydorid Cladocera,
W72-09458 2H

GRANT, A. C.
Distributional Trends in the Recent Marine Sediments of Northern Baffin Bay,
W72-09763 2L

GRAY, H. L.
On Bias Reduction in Estimation,
W72-09358 7C

GREELEY, R. S.
Monitoring the Environment of the Nation,
W72-09230 6G

GRIFFIN, D. B.
Process for Removal of Inorganic and Organic Matter from Waste Water Systems,
W72-09500 5D

GRIGOR'YEVA, A. S.
Long-Term Cyclic Fluctuations of Atmospheric Precipitation in the USSR (Mnogoletniye tsiklicheskiye kolebaniya atmosfernykh osadkov na territorii SSSR),
W72-09747 2B

GRUENDLING, G. K.
Ecology of the Epipelic Algal Communities in Marion Lake, British Columbia,
W72-09681 5C

GUARDIGLI, A.
Determination of Carbetamide Residues and its Aniline Metabolite,
W72-09316 5A

GUIDELLI, R.
Electro-Oxidation of Iodine on Smooth Platinum in Aqueous Media,
W72-09245 5A

GURTLER, J.
Improved Continuous Radio Gas Chromatography of Hydrogen-3-- and Carbon-14--Labelled Compounds Using Hydrocracking,
W72-09352 5A

GURVICH, S. I.
New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

GUSEV, A. G.
Present State and Development of Scientific Research on Prevention of Fishery Pollution (Sostoyaniye i perspektivy nauchno-issledovatel'skikh rabot po probleme okhrany rybokhozyaystvennykh vodoyemov ot zagryazneniya),
W72-09648 5C

GUTENMANN, W. H.
Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

HACH, C. C.
Understanding Turbidity Measurement,
W72-09671 5F

HALL, J. D.
A Direct Method of Measuring Benthic Primary Production in Streams,
W72-09405 5A

HAMADA, T.
Flow Measurements of Ice-Covered Rivers in Hokkaido,
W72-09628 2C

HANNA, E. M.
Ion Association and the Analysis of Precise Conductimetric Data,
W72-09544 2K

HANNA, S. R.
Meteorological Effects of Cooling Tower Plumes,
W72-09305 2B

HANNON, N. J.
The Mangrove Swamp and Salt Marsh Communities of the Sydney District. IV. The Significance of Species Interaction,
W72-09286 2L

HANSMANN, E. W.
A Direct Method of Measuring Benthic Primary Production in Streams,
W72-09405 5A

HARDWICK, D. F.
Physical and Biotic Factors Affecting Euxoa Species Abundance in Western North America: A Regression Analysis,
W72-09414 2I

HARGROVE, S. H.
Agricultural Water Demands,
W72-09526 6D

HARLEMAN, D. R. F.
An Analytical and Experimental Investigation of Surface Discharges of Heated Water,
W72-09729 5B

HARRIS, E. J.
A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

HARRIS, R.
Dairying in the Desert: Agricultural Innovation in Tunisia,
W72-09752 3F

HARRISON, W.
Beach Water Table and Beach-Profile Measuring Equipment,
W72-09758 7B

HARTLAND-ROWE, R.
A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

HARWOOD, R. M.
Measurement and Control of Particulate Matter in Filter Effluents,
W72-09693 5F

HASTINGS, R. W.
Ecology and Life History of the Diamond Killifish: Adinia xenica (Jordan and Gilbert),
W72-09360 2L

HAUSER, L. G.
Comparison of Evaporative Losses in Various Condenser Cooling Water Systems,
W72-09735 2D

HAWKINSON, R. O.
A Comparison of Mass-Transfer and Climatic-Index Evaporation Computations from Small Reservoirs in Texas,
W72-09555 2H

HAZEN, T. E.
Photographic Studies of the Dunging Behavior of Pigs in Confinement,
W72-09153 5G

HEADY, E. O.
Agricultural Water Demands,
W72-09526 6D

HEALEY, M. G.
Design of the Beddington Works of the London Borough of Croydon,
W72-09400 5D

HEALY, M. L.
Voltammetric Measurement of Zinc in the Northeastern Tropical Pacific Ocean,
W72-09413 5A

HEBERT, H. F.
Catches of Postlarval White Shrimp, 'Penaeus setiferus' (Linn.), and Brown Shrimp, P. aztecus ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967,
W72-09674 2L

HEEREN, H.
Air Cooling for Condensation and Exhaust Heat Rejection in Large Generating Stations,
W72-09738 5D

HEFNER, A.
A Quick and Convenient Measurement Method for Surface and Liquid Contamination Using the TLD System,
W72-09451 5A

HEINLE, D. R.
Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

HENRY, C. J.
How Seattle Beat Pollution,
W72-09179 5C

HENWOOD, R. W.
Sunlight Photochemistry of Ferric Nitrilotriacetate Complexes,
W72-09379 5A

HERNADI, F.
Mechanism of the Growth Inhibitory Effect of Cysteine on Escherichia Coli,
W72-09407 5C

HERRMANN, F. A. JR
Status Report on the Gastineau Channel Model Study,
W72-09762 8B

HESSEL, D. L.
Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

HESSELBERG, R. J.
Column Extraction of Pesticides from Fish, Fish Food and Mud,
W72-09315 5A

HETLING, L. J.
Chemical-Physical Wastewater Treatment Phase 2: Activated Carbon Adsorption and Polishing,
W72-09302 5D

HIBBERT, A. R.
Chaparral Treatment Effects on Streamflow,
W72-09604 3B

HICKS, S. D.
On the Classification and Trends of Long Period Sea Level Series,
W72-09757 7C

HIGGINS, R. V.
Numerical Methods for Determining Streamlines and Isopressures for Use in Fluid-Flow Studies,
W72-09754 2F

HILLMAN, J. J.
Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

HINDERAKER, P. H.
Simple Device for Transferring and Eluting Thin-Layer Chromatographic Fractions,
W72-09342 2K

HINES, M. S.
Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

HINES, N. W.
Public Regulation of Water Quality in the United States,
W72-09527 5G

HINZE, W. J.
Mapping Buried Bedrock Topography With Gravity,
W72-09618 2F

HIRAMATO, T.
Role of Low-Background Beta-Ray Spectrometers for Rapid Assay of Environmental Samples,
W72-09447 5A

HIYAMA, Y.
Automatic Monitoring Method Using Biological Concentration for Marine Radioactive Contamination,
W72-09454 5A

HOBBIE, J. E.
Phosphorus and Eutrophication in the Pamlico River Estuary, N. C., 1966-1969 - A Summary,
W72-09655 5C

HOBSON, K. D.
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

HODGE, V. F.
Cyanide Extraction and Electrodisposition of Trace Amounts of Radioactive Silver From Large Biological Samples,
W72-09246 5A

HODGES, A. R.
Burner Memory Following Atomic Absorption Spectrophotometric Analysis of Moderately Volatile Organometallic Complexes,
W72-09247 5A

HODGKIN, E. P.
Interspecies Conflict in Estuarine Copepods,
W72-09231 2L

HODSON, M. V.
Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

HOFFMAN, G. B.
The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

HOFFSOMMER, J. C.
Analysis of Explosives in Sea Water,
W72-09312 5A

HOFSTETTER, R. H.
Penetration of Bog Peats and Lake Sediments by Tritium From Atmospheric Fallout,
W72-09240 5B

HOLLADAY, G.
Sampling and Analytical Systems for Measuring Environmental Radioactivity,
W72-09453 5A

HOLLY, L.
Air Cooling for Condensation and Exhaust Heat Rejection in Large Generating Stations,
W72-09738 5D

HOLMES, J. F.
Apparatus for Reoxygenating a Body of Water,
W72-09503 5G

HOLT, B. D.
Variations of Sulfur Isotope Ratios in Samples of Water and Air near Chicago,
W72-09336 5B

HOLT, C. F.
Stream Turbulence Effects on Turbulent Boundary Layer,
W72-09257 2E

HOLTERMANN, S. E.
Externalities and Public Goods,
W72-09143 6A

HONSTEAD, J. F.
Recreational Use of the Columbia River: Evaluation of Environmental Exposure,
W72-09426 6B

HORTON, J. W.
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

HOTTLE, G. A.
Summer Conference of Society for Applied Bacteriology, Liverpool, 13-15 July 1971,
W72-09675 5C

HOWELLS, D. H.
Quality of Effluent from Swine Production Areas,
W72-09151 5B

HUBBELL, D. W.
Studies of Sediment Transport in the Columbia River Estuary,
W72-09551 5B

HUGUENIN, J. E.
Controlled Eutrophication-Increasing Food Production from the Sea by Recycling Human Wastes,
W72-09378 5G

HULTGREN, J. P.
Photographic Studies of the Dunging Behavior of Pigs in Confinement,
W72-09153 5G

HUNTER, V. D.
Animal-Sediment Relations and Community Analysis of a Florida Estuary,
W72-09177 5C

HUSSAIN, S.
Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

HUYER, A.
On the Water of the Canadian Arctic Archipelago, an Atlas Presentation of 1961 and 1962 Data,
W72-09227 7C

HYLE, R. C.
Rate Philosophy,
W72-09142 6C

IBRAHIM, A.
Mapping Buried Bedrock Topography With Gravity,
W72-09618 2F

IKRAMOV, ZH.
Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

INGEBO, P. A.
Chaparral Treatment Effects on Streamflow,
W72-09604 3B

INGLE, R. M.
Prediction of the Florida Red Tide by Means of the Iron Index; Red Tide, Iron and Humic Acid Levels in Streams.
W72-09524 5B

ISENHOUR, T. L.
Mass Spectrometric Isotope Ratio Measurements and Peak Area Integration using the Peak-Switching Feature of the Aei MS-902,
W72-09326 5A

ISMAYLOV, I. A.
Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

IVANOV, S.
Perennial Grass Mixtures for Hay-Pasture Use of Low-Productive and Eroded Lands Under Dry Farming Conditions, (In Bulgarian),
W72-09772 3F

IVES, K. J.
Filtration of Water and Wastewater,
W72-09393 5D

IWASHIMA, K.
Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

JACKSON, J. E.
All Count Distributions are not Alike,
W72-09339 7B

JACKSON, M. D.
Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

JAECH, J. L.
On the use of Tolerance Intervals in Acceptance Sampling by Attributes,
W72-09311 7C

JAIN, S. C.
Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

JAMES, H.
Coated Wire Ion Selective Electrodes,
W72-09324 2K

JAMES, H. J.
Role of Solvent Extraction Parameters in Liquid Membrane Ion Selective Electrodes,
W72-09325 2K

JAQUISH, R. E.
Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

JASKE, R. T.
Methods for Evaluating Effects of Transient Conditions in Heavily Loaded and Extensively Regulated Streams,
W72-09731 5B

JAWORSKI, N. A.
Nutrient Management in the Potomac Estuary,
W72-09171 5C

JEGLUM, J. K.
Plant Indicators for pH and Water Level in Peatlands at Candle Lake, Saskatchewan,
W72-09730 2H

JELLINEK, H. H. G.
Desalination by High Pressure Solidification of Water to Ice VI,
W72-09516 3A

JENSEN, M. E.
Estimating Soil Moisture Depletion from Climate, Crop and Soil Data,
W72-09223 2G

JILEK, R.
Determination of Environmental Radioactivity by Liquid-Scintillation Spectrometry,
W72-09448 5A

JOHNSON, C. L.
A Statutory Analysis of Florida's Water Pollution Control Legislation,
W72-09479 6E

JOHNSON, D. L.
Arsenate in the Western North Atlantic and Adjacent Regions,
W72-09249 5A

JOHNSON, E. L.
Methylation of Pentachlorophenol by Trichoderma Virgatum,
W72-09562 5B

JOHNSON, J. L.
Column Extraction of Pesticides from Fish, Fish Food and Mud,
W72-09315 5A

JOHNSON, J. O. JR
Water Pollution Monitoring Stations: An Ounce of Prevention,
W72-09374 5A

JONES, A. M.
Comparison of Methods of Estimating the Number of Escherichia coli in Edible Mussels and the Relationship between the Presence of Salmonellae and E. coli,
W72-09319 5A

JONES, B. L.
Reconnaissance Study of Sediment Transported by Streams, Island of Oahu,
W72-09759 2J

JONES, D. M. A.
Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

JONES, R. D. H.
Nutrient Flux in Estuaries,
W72-09172 5C

JONES, R. H.
Performance and Application of a New Reference Electrode for Process Potentiometric Measurements,
W72-09242 5A

JORGENSON, J. L.
Development and Trail use of Acceptance Sampling Plans for Compacted Embankments,
W72-09700 8D

KAHN, H. L.
The Determination of Lead and Cadmium in Soils and Leaves by Atomic Absorption Spectroscopy,
W72-09331 5A

KAISER, R.
Process for Cleaning up Oil Spills,
W72-09490 5G

KAMADA, H.
Measurements of 89Sr and 90Sr in Environmental Samples by a Low-Background Beta-Ray Spectrometer,
W72-09450 5A

KAMADA, S.
A Study on the Formation of the River Ice in a Snow Area,
W72-09637 2C

KAMEL, A. M.
Selection of Scale for Riprap Model of In-Shore Harbor, Site X. Analytical Investigation,
W72-09615 8B

KAMRA, A. K.
Airborne and Ground Measurements of the Atmospheric Potential Gradient During a Solar Eclipse,
W72-09220 2B

Effect of Electric Field on Charge Separation by the Falling Precipitation Mechanism in Thunderclouds,
W72-09215 2B

KAPPEN, L.
Responses of Stomata to Changes in Humidity,
W72-09783 2D

KARASEK, F. W.
GC/MS/Computers,
W72-09327 2K

KARCZ, I.
Sedimentary Structures Formed by Flash Floods in Southern Israel,
W72-09540 2J

KARI, C.
Mechanism of the Growth Inhibitory Effect of Cysteine on Escherichia Coli,
W72-09407 5C

KARMIL'CHIK, A. YA.
Gas-Liquid Chromatographic Determination of Furfural in Aqueous Solution,
W72-09403 5A

KARP, R. M.
Optimal Search for Pollution Sources,
W72-09232 5B

KARYAKIN, V. A.
Determination of the Zone of Origin of Tsunamis (Opredeleniye mesta vozniknoveniya tsunami),
W72-09280 2L

KAUFMAN, W. J.
Toxicity Assessment of Treated Municipal Wastewaters,
W72-09582 5D

KAWAMURA, S.
Rapid and Simple Determination of 59Fe, 60Co, 65Zn, 137Cs, and 95Zr in Concentrated Salts Solutions,
W72-09440 5A

KAWAZU, K.
Studies on a Piscicidal Constituent of Hura crepitans: I. Isolation and Characterization of Huratoxin and its Piscicidal Activity,
W72-09779 5C

KEIRN, M. A.
Nitrogen Fixation by Bacteria in Lake Mize, Florida, and in Some Lacustrine Sediments,
W72-09579 5C

KELLY, D. B.
The Virginia Flood of 1969,
W72-09760 2E

KEMP, P. H.
Initiation of Ripples by Artificial Disturbances,
W72-09260 2J

KENNEDY, H. D.
Effects of Malathion on Two Warm-Water Fishes and Aquatic Invertebrates in Ponds,
W72-09567 5C

KENNEDY, J. F.
The Iowa Low Temperature Flow Facility,
W72-09627 2C

Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

Temperature and Flow Conditions During the Formation of River Ice,
W72-09631 2C

KENNEDY, V. S.
Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

Upper Temperature Tolerances of Some Estuarine Bivalves,
W72-09734 5C

KEPAK, F.
Self-Diffusion of Trace Concentrations of Ce-144, Pm-147, and Eu-155 in Water Solutions,
W72-09530 5B

KERR, P. C.
The Interrelation of Carbon and Phosphorus in Regulating Heterotrophic and Autotrophic Populations in an Aquatic Ecosystem, Shriner's Pond,
W72-09159 5C

KERSNAR, F. J.
How Seattle Beat Pollution,
W72-09179 5C

KEULEGAN, G. H.
The Approximate Theories of Pneumatic Wave Generators,
W72-09541 8B

KHADEMI, B.
Investigation and Measurement of Radium in Ramsar Mineral Water,
W72-09266 5B

KHOMCHENKO, G. P.
Methods for Clean Condensation of Atmospheric Moisture for Its Use in a Closed Ecological System,
W72-09583 5D

KHRISTOFOROV, V. S.
Study of Crude Oil and Some of its High Molecular Compounds Using Electron Paramagnetic Resonance (Review),
W72-09404 5A

KIMURA, SEKIO
Study on the Toxicity of Agricultural Control Chemicals in Relation to Freshwater Fisheries Management: V. Some Effects of Sodium Pentachlorophenate to Freshwater Fishes,
W72-09184 5C

KINCANNON, D. F.
Organic Concentration and Hydraulic Loading Versus Organic Loading in Evaluation of Trickling Filter Performance,
W72-09596 5D

KING, C. T. III
The Effects of Cobalt-60 Radiation on Textile Processing Waste,
W72-09391 5D

KING, D. L.
Carbon Limitation in Sewage Lagoons,
W72-09162 5C

Selective Withdrawal Studies for the Fish Hatchery Outlets at Pueblo Dam--Mathematical and Physical Models,
W72-09194 8B

KING, P. H.
Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

KISTANOV, N. S.
Effects of Irrigation on Salt Regime of Dark-Chestnut Terrace Soils in the Transvolga Region (Vliyaniye orosheniya na solevoy rezhim terrasovykh temno-kashtanovykh pochv Zavolzh'ya),
W72-09751 3F

KIVISILD, H. R.
River and Lake Ice Terminology,
W72-09625 2C

KIYOSAWA, K.
Water Movement in a Plant Cell on Application of Hydrostatic Pressure,
W72-09786 2I

KLEIN, M. M.
Nucleic Acid Enzyme Studies of Nonfermentative Gram-Negative Bacteria Using Thin-Layer Chromatography,
W72-09408 5A

KNEESE, A. V.
Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

KNYAZEV, K. A.
Experience in the Operation of the Bratsk Hydroelectric Plant,
W72-09703 8C

KONONOVA, N. E.
Effects of Pesticides on the Life of a Water Body (K voprosu o vliyanii pestitsidov na zhizn' vodoyema),
W72-09651 5C

KORANDA, J. J.
Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

Sampling and Analytical Systems for Measuring Environmental Radioactivity,
W72-09453 5A

KORCHAGOVA, E. K.
Gas-Liquid Chromatographic Determination of Furfural in Aqueous Solution,
W72-09403 5A

KORITALA, S.
Selective Hydrogenation of Soybean Oil. VI. Copper-on-Silica Gel Catalysts,
W72-09346 5A

KOSHELEV, B. A.
Distribution and Composition of Carbonates in the Upper Layer of Bottom Sediments of the Atlantic Ocean (Raspredelenive i sostav karbonatov v verkhnem sloye donnykh osadkov Atlanticheskogo okeana),
W72-09256 2J

KOSHY, M. M.
Effect of Elevation and Rainfall on the Physicochemical Properties of the Soils of the High Ranges of Kerala,
W72-09774 2G

KOTLYAR, V. Z.
Daily Dynamics of Transpiration of Upper and Lower Sides of Leaves in Some Monocotyledonous and Dicotyledonous Plants, (In Ukrainian),
W72-09785 2D

KOTSUR, M. V.
Daily Dynamics of Transpiration of Upper and Lower Sides of Leaves in Some Monocotyledonous and Dicotyledonous Plants, (In Ukrainian),
W72-09785 2D

KOVACS, A.
The Morphlogy and Physical Properties of Pressure Ridges: Barrow, Alaska, April 1969,
W72-09639 2C

KOVACS, P.
Mechanism of the Growth Inhibitory Effect of Cysteine on Escherichia Coli,
W72-09407 5C

KRAFT, J. C.
A Guide to the Geology of Delaware's Coastal Environments,
W72-09614 2J

KRAJEWSKI, B.
Tropospheric Scavenging of 90Sr and 3H,
W72-09528 5A

KREUSCH, E.
Wastewater Demineralization by Ion Exchange,
W72-09384 5D

KREY, P. W.
Tropospheric Scavenging of 90Sr and 3H,
W72-09528 5A

KRISTINSSON, B.
Ice Monitoring Equipment,
W72-09626 2C

KRIVA, J.
Self-Diffusion of Trace Concentrations of Ce-144, Pm-147, and Eu-155 in Water Solutions,
W72-09530 5B

KRIZ, G. J.
Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

Quality of Effluent from Swine Production Areas,
W72-09151 5B

KRUT', V. M.
Change in Properties of Chernozems of the Dnepropetrovsk Oblast as a Result of Erosion (Izmeneniye svoystv chernozemov Dnepropetrovskoy oblasti v rezul'tate erozii),
W72-09744 2G

KULES, I.
Kinetics of OH Radical Reactions in Irradiated Ordinary and Supercooled Water,
W72-09428 5B

KUMADA, HIROSHI
Study on the Toxicity of Agricultural Control Chemicals in Relation to Freshwater Fisheries Management: V. Some Effects of Sodium Pentachlorophenate to Freshwater Fishes,
W72-09184 5C

KUNKLE, G. A.
Possible Origin of Clostridium Botulinum Contamination of Eskimo Foods in Northwestern Alaska,
W72-09417 5C

KUROTAKI, K.
Rapid and Simple Determination of 59Fe, 60Co, 65Zn, 137Cs, and 95Zr in Concentrated Salts Solutions,
W72-09440 5A

KUR'YEROVA, L. V.
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

KUWABARA, R.
Automatic Monitoring Method Using Biological Concentration for Marine Radioactive Contamination,
W72-09454 5A

LAISK, A.
Changed Resistance of Aspen Mesophyll as a Response to Rapid Leaf Drying, (In Russian),
W72-09775 2D

LAKKIS, S.
Contribution of the Study of Zooplankton in Lebanese Waters, (Contribution A L' Etude Du Zooplancton Des Eaux Libanaises),
W72-09355 5A

LALA, G. G.
The Design, Construction, and Use of an Ice Crystal Counter for Ice Crystal Cloud Studies by Aircraft,
W72-09209 2B

LALA, G. G.

The Seeding of Ice Saturated Layers in the Atmosphere: A Computational Study,
W72-09207 2B

LAMONDS, A. G.
Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

LANE, C. B.
A Direct Method of Measuring Benthic Primary Production in Streams,
W72-09405 5A

LANGE, O. L.
Responses of Stomata to Changes in Humidity,
W72-09783 2D

LANGFORD, C. H.
Sunlight Photochemistry of Ferric Nitrilotriacetate Complexes,
W72-09379 5A

LARINOFF, M. W.
Power Plant Siting, Performance, and Economics with Dry Cooling Tower Systems,
W72-09741 5D

LAWLER, G. H.
Emergence of Caddisflies (Trichoptera) and Mayflies (Ephemeroptera) from Heming Lake, Manitoba,
W72-09570 5C

LAZIER, S. S.
Temperature Gradients in a Lake Ice Cover,
W72-09630 2C

LEAR, D. W. JR
Nutrient Management in the Potomac Estuary,
W72-09171 5C

LEBEDEVA, G. D.
Determination of the Toxicity of Contaminated Freshwater with Respect to Certain Hydrobionts (Opredeleniye toksichnosti zagryaznennykh presnykh vod v otnoshenii nekotorykh gidrobiontov),
W72-09649 5C

LECLERC, H.
Mycobacteria of Sewage Water and Sediment, (In French),
W72-09777 5A

LEDERER, M.
A Comparison of Some Ready-For-Use Thin Layers for the Separation of Heavy Metals with Butanol-3 N HCl,
W72-09353 5A

LEE, G. F.
Adsorption of Lindane and Dieldrin Pesticides on Unconsolidated Aquifer Sands,
W72-09539 5B

LEFAR, M. S.
Determination of Carbetamide Residues and its Aniline Metabolite,
W72-09316 5A

LEFKOVITCH, L. P.
Physical and Biotic Factors Affecting Euxoa Species Abundance in Western North America: A Regression Analysis,
W72-09414 2I

LEIGHTON, A. J.
Numerical Methods for Determining Streamlines and Isopressures for Use in Fluid-Flow Studies,
W72-09754 2F

LERMAN, J. C.
Natural Isotopes in the Groundwater of the Tulum Valley, San Juan, Argentina,
W72-09276 2F

LEVANDOWSKY, M.
Ecological Niches of Sympatric Phytoplankton Species,
W72-09180 5C

LEVINE, S.
The Role of the Diffuse Layer in Water-In-Oil Microemulsions,
W72-09335 5A

LEWELLEN, R. I.
Permafrost Erosion Along the Beaufort Sea Coast,
W72-09546 2J

LI, N. N.
Removal of Inorganic Species by Liquid Membrane,
W72-09497 5D

LIDSTER, W. A.
Region 7 Launches Program to reduce Subsurface Drain Costs,
W72-09697 4A

LIGHT, R. J.
An Analysis of Variance for Categorical Data,
W72-09357 7C

LIKENS, E.
Eutrophication and Aquatic Ecosystems,
W72-09156 5C

LILIENTHAL, M. S.
Monitoring the Environment of the Nation,
W72-09230 6G

LILJEQVIST, L.
Improved Continuous Radio Gas Chromatography of Hydrogen-3-- and Carbon-14--Labelled Compounds Using Hydrocracking,
W72-09352 5A

LINK, D. R.
Geology and Ground-Water Resources of Northwestern North Carolina,
W72-09264 4B

LINK, V. G.
Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

LISITSYN, A. P.
Distribution and Composition of Carbonates in the Upper Layer of Bottom Sediments of the Atlantic Ocean (Raspredelenive i sostav karbonatov v verkhnem sloye donnykh osadkov Atlanticheskogo okeana),
W72-09256 2J

LISK, D. J.
Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

LISTON, J.
Effects of Incubation Temperature on the Salt Tolerance of Salmonella,
W72-09371 5C

LIU, C. S.
Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

LIVINGSTON, H. D.
Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

LOFROTH, G.
Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

LOHMAN, S. W.
Ground-Water Hydraulics,
W72-09769 2F

LONG, B. W.
MBF Pilot Plant Filtration of Combined Municipal and Paper Mill Waste,
W72-09301 5D

LONGMAN, G. F.
The Determination of Nitrilotriacetic Acid (NTA) In Sewage and Sewage Effluent,
W72-09251 5A

LONNQUIST, C. G.
Water Treatment Plant Staging Policy,
W72-09289 5F

LOSCH, R.
Responses of Stomata to Changes in Humidity,
W72-09783 2D

LUBYANOV, I. P.
Effects of DDT and Hexachlorocyclohexane on Aquatic Animals (K voprosu o vliyanii DDT i geksakhlorana na vodnyye organizmy),
W72-09652 5C

LYUBYNS'KYI, M. A.
Daily Dynamics of Transpiration of Upper and Lower Sides of Leaves in Some Monocotyledonous and Dicotyledonous Plants, (In Ukrainian),
W72-09785 2D

MACKAY, D. W.
The Relative Importance of Freshwater Input, Temperature and Tidal Range in Determining Levels of Dissolved Oxygen in a Polluted Estuary,
W72-09345 5B

MADSEN, H. C.
Agricultural Water Demands,
W72-09526 6D

MAGNUSON, J. J.
Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

MAGUIRE, B. JR
Species and Individual Productivity in Phytoplankton Communities,
W72-09239 5C

MAHON, H. I.
Development of Cellulose Triacetate Hollow Fiber Reverse Osmosis Modules for Brackish Water Desalination,
W72-09517 3A

MAHONEY, G. W. A.
Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

MAIDA, A.
Geologic and Hydrologic Study of Northern Sardinia: Report Number 3. The Provision of Water for the Region of Anglona, (In Italian),
W72-09781 6D

MAKER, H. J.
Land Classification for Irrigation, Roosevelt County,
W72-09663 3F

Land Classification for Irrigation, Torrance County,
W72-09664 3F

Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

MALJKOVIC, D.
Polarography of Seawater II. Complex Formation of Cadmium with EDTA,
W72-09673 5A

MALONEY, T. E.
Algal Responses to Nutrient Additions in Natural Waters. I. Laboratory Assays,
W72-09164 5C

Research on Algal Odor,
W72-09694 5F

MALUEG, K. W.
Algal Responses to Nutrient Additions in Natural Waters. II. Field Experiments,
W72-09165 5C

MANDEL, J.
Repeatability and Reproducibility,
W72-09310 7C

MANDEL, M.
Taxonomy of Marine Bacteria: Beneckea nigrapulchrituda Sp. N.,
W72-09241 5A

MANDEL, S.
Groundwater Flow in Calcareous Aquifers in the Vicinity of Barcelona, Spain,
W72-09277 2F

MARGOLIN, B. H.
An Analysis of Variance for Categorical Data,
W72-09357 7C

MARKEL, A. L.
Method of and Apparatus for Skimming Flotsam from the Surface of a Body of Water,
W72-09499 5G

MARKLE, J. C.
Hydrolysis and Solvent Partition of Phosdrin and Related Organophosphates,
W72-09321 5B

MARKSON, R.
Airborne and Ground Measurements of the Atmospheric Potential Gradient During a Solar Eclipse,
W72-09220 2B

Considerations Regarding Solar and Lunar Modulation of Geophysical Parameters, Atmospheric Electricity and Thunderstorms,
W72-09221 2B

Mountain-Peak Potential-Gradient Measurements and the Andes Glow,
W72-09219 2B

MARSHALL, K. C.
Mechanism of the Initial Events in the Sorption of Marine Bacteria to Surfaces,
W72-09568 5C

MARTIN, D. F.
Prediction of the Florida Red Tide by Means of the Iron Index; Red Tide, Iron and Humic Acid Levels in Streams.
W72-09524 5B

MARTIN, J. R.
Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

MARTINELLI, M. JR
Take the Plunge,
W72-09612 2C

MARTINY, E.
Determination of Antimony in Geological Materials by Atomic Absorption Spectrometry,
W72-09328 5A

MARUYAMA, T.
Role of Low-Background Beta-Ray Spectrometers for Rapid Assay of Environmental Samples,
W72-09447 5A

MARZIALE, R. O.
Malacological Resources of the Gulf of San Matias with some Observations made in the Exploratory Campaign SAO-I-71,
W72-09708 2L

MATCHES, J. R.
Effects of Incubation Temperature on the Salt Tolerance of Salmonella,
W72-09371 5C

MATIDA, YOSHIHIRO
Study on the Toxicity of Agricultural Control Chemicals in Relation to Freshwater Fisheries Management: V. Some Effects of Sodium Pentachlorophenate to Freshwater Fishes,
W72-09184 5C

MATUCHA, M.
Gas Chromatographic Analysis of the Higher Fatty Acids of the Alga Chlorella Vulgaris (Pyrenoidosa),
W72-09365 5A

MAULDING, J. S.
Stoichiometry of the Coagulation of Color-Causing Organic Compounds with Ferric Sulfate,
W72-09695 5F

MAURER, E. W.
The Biodegradation of Some Sulfated Alkanolamides,
W72-09344 5B

MCDOUGALL, D.
Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

MCERLEAN, A. J.
Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

MCGREEVY, L. J.
Ground-Water Resources of Cache Valley, Utah and Idaho,
W72-09558 4B

MCLAIN, E. A.
Development of Cellulose Triacetate Hollow Fiber Reverse Osmosis Modules for Brackish Water Desalination,
W72-09517 3A

MCMAHON, THOMAS C.
Factors Affecting Nitrification Kinetics,
W72-09174 5D

MCNELIS, P.
Getting Representative Water Samples,
W72-09672 5A

MCRAE, E. A.
Water and Land Resources, Ouachita River Basin in Arkansas,
W72-09309 6D

MCTAGGART-COWAN, J. D.
The Design, Construction, and Use of an Ice Crystal Counter for Ice Crystal Cloud Studies by Aircraft,
W72-09209 2B

MCWILLIAM, J. R.
Effect of Osmotic and Matric Potentials on the Availability of Water for Seed Germination,
W72-09773 2I

MEAD, E. R.
Best Linear Unbiased Estimates of the Parameters of the Logistic Distribution Based on Selected Order Statistics,
W72-09348 7C

MERANGER, J. C.
Zinc Retention in Young Rats Fed Increasing Levels of High-Zinc Oysters,
W72-09716 5C

MERCADO, A.
Groundwater Flow in Calcareous Aquifers in the Vicinity of Barcelona, Spain,
W72-09277 2F

MEREDITH, D. D.
Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

MERRILL, A. S.
Data on Samples for Surf Clams and Ocean Quahogs,
W72-09521 7C

MESGHALI, A.
Investigation and Measurement of Radium in Ramsar Mineral Water,
W72-09266 5B

METGE, M.
Temperature Gradients in a Lake Ice Cover,
W72-09630 2C

MICHAEL, A. D.
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

MIHURSKY, J. A.
Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

Upper Temperature Tolerances of Some Estuarine Bivalves,
W72-09734 5C

MILLER, L. G.
Possible Origin of Clostridium Botulinum Contamination of Eskimo Foods in Northwestern Alaska,
W72-09417 5C

MILLER, T. A.
Effects of Polymer Formulations of Dursban and Abate on Non-Target Organism Populations, April - October, 1970,
W72-09721 5C

Polymer Formulations of Dursban and Abate as Mosquito Larvicides, April - October, 1970,
W72-09720 5B

MILLER, W. E.
Algal Responses to Nutrient Additions in Natural Waters. I. Laboratory Assays,
W72-09164 5C

MILLS, M. A.
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

MITA, M.
Measurements of 89Sr and 90Sr in Environmental Samples by a Low-Background Beta-Ray Spectrometer,
W72-09450 5A

MITCHELL, N. T.
Rapid Methods for Specific Radionuclide Analysis and their Application to Aquatic Emergency Conditions,
W72-09457 5A

MITCHELL, R.
Mechanism of the Initial Events in the Sorption of Marine Bacteria to Surfaces,
W72-09568 5C

MITSUI, T.
Studies on a Piscicidal Constituent of Hura crepitans: I. Isolation and Characterization of Huratoxin and its Piscicidal Activity,
W72-09779 5C

MIZUNO, T.
Preliminary Hydrobiological Research of Some Southeast Asian Inland Waters, (In Japanese),
W72-09394 2K

MOGHISSI, A. A.
Monitoring of Tritium Under Emergency Conditions,
W72-09443 5A

MOLDAU, H.
Model of Plant Productivity at Limited Water Supply Considering Adaptation,
W72-09782 2I

MOLOF, A. H.
System for Measuring Organic Content of Water,
W72-09493 5D

Waste Water Treatment Process,
W72-09492 5D

MOOK, W. G.
Natural Isotopes in the Groundwater of the Tulum Valley, San Juan, Argentina,
W72-09276 2F

MOOSBURNER, O.
Analysis of the Ground-Water System by Electrical-Analog Model, Avra Valley, Pima and Pinal Counties, Arizona,
W72-09765 7C

MORI, S.
Preliminary Hydrobiological Research of Some Southeast Asian Inland Waters, (In Japanese),
W72-09394 2K

MORIARTY, F.
Pollutants and Food-Chains,
W72-09402 5C

MORIN, G.
Hydro-Physiographic Model,
W72-09234 6A

MORIONES-CASAS, L.
List of Organizations, Meetings, Programmes, Etc., Related to Fisheries,
W72-09262 7A

Selected Terms Used in Fish Culture,
W72-09261 7A

MOROZOVA, N. G.
Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

MORRIS, D. E.
The Potential Contribution of Desalting to Future Water Supply in New Mexico,
W72-09306 3A

MORRISON, W. R.
Chemical Stabilization of Soils,
W72-09191 8D

MORSE, W. L.
Stream Temperature Prediction Under Reduced Flow,
W72-09259 4A

MORTON, H. V.
The Fountains of Rome,
W72-09380 8A

MORTON, S. D.
Natural Carbon Sources, Rates of Replenishment, and Algal Growth,
W72-09168 5C

MOSKVITIN, A. I.
Geologic Age of Ancient Lake Sediments of the Mologo-Sheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

MOSSER, J. L.
Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

MRVA, A. E.
Use of Acid-Treated Sodium Silicate in Coagulation,
W72-09691 5F

MUKHRANELI, I. A.
Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

MURADOV, A. S.
Groundwater and Drainage-Water Mineralization in the Mugan-sal'yany Region (Mineralizatsiya gruntovykh i drenazhnykh vod Mugano-Sal'yanskogo massiva),
W72-09750 4B

MURAKI, Y.
A Study on the Formation of the River Ice in a Snow Area,
W72-09637 2C

MURALIDHAR, D.
Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

MURRAY, D.
Determination of Nitrilotriacetic acid in Inland Waters by Gas Chromatography of the Trimethyl Ester,
W72-09711 5A

MUSPRATT, M. A.
Optimal Distribution of Water to Irrigation Canals,
W72-09195 3F

MUZZARELLI, M. G.
Chitin and Chitosan as Chromatographic Supports and Absorbents for Collection of Metal Ions from Organic and Aqueous Solutions and Sea Water,
W72-09491 2K

MYERS, R. H.
Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

NAAMAN, A. E.
Tensile Tests of Ferrocement,
W72-09709 8F

NABA, K.
A Quick and Convenient Measurement Method for Surface and Liquid Contamination Using the TLD System,
W72-09451 5A

NAGY, Z.
Mechanism of the Growth Inhibitory Effect of Cysteine on Escherichia Coli,
W72-09407 5C

NAIR, K.
Effect of Elevation and Rainfall on the Physicochemical Properties of the Soils of the High Ranges of Kerala,
W72-09774 2G

NAIR, R. R.
Response of Rice to Phosphate Manuring in a Waterlogged Lateritic Sandy Loam of Kerala,
W72-09578 3F

NAKAHARA, R. H.
Reconnaissance Study of Sediment Transported by Streams, Island of Oahu,
W72-09759 2J

NARAYANAN, R.
Theoretical Analysis of Flow Past Leaf Gate,
W72-09274 8B

NAZAROV, G. N.
Glaciers and Geological Evolution of the Earth (Oledeneniya i geologicheskoye razvitiye zemli),
W72-09279 2C

NEDWELL, D. B.
The Seasonal Selection by Temperature of Heterotrophic Bacteria in an Intertidal Sediment,
W72-09350 5C

NEHER, R. E.
Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

NEILL, W. E.
Species and Individual Productivity in Phytoplankton Communities,
W72-09239 5C

NEILL, W. H.
Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

NELLIST, G. R.
Development and Use of a Large-Volume Automatic Respirometer,
W72-09396 5D

NELSON, H. E.
Evaporation-Reverse Osmosis Water Desalination System,
W72-09506 3A

NELSON, L. L.
Laboratory Release Rate Studies of Dursban-Polymeric Formulations, March-July 1970,
W72-09676 5B

NELSON, R.
Mountain-Peak Potential-Gradient Measurements and the Andes Glow,
W72-09219 2B

NELSON, R. T.
Design, Construction and Testing of the Dropsonde,
W72-09211 2B

NETI, R. M.
Performance and Application of a New Reference Electrode for Process Potentiometric Measurements,
W72-09242 5A

NEUSHUL, M.
The Santa Barbara Oil Spill Part 1: Initial Quantities and Distribution of Pollutant Crude Oil,
W72-09682 5B

The Santa Barbara Oil Spill Part 2: Initial Effects on Intertidal and Kelp Bed Organisms,
W72-09683 5C

NEWTON, E. W.
Floating Contaminant Constraining Fence,
W72-09512 5G

NGUEMATCHA, R.
Mycobacteria of Sewage Water and Sediment, (In French),
W72-09777 5A

NICOL, K. J.
Agricultural Water Demands,
W72-09526 6D

NIELSEN, A. M.
Chalcocite Oxidation and Coupled Carbon Dioxide Fixation by Thiobacillus Ferrooxidans,
W72-09359 5C

NIXON, R. M.
Offshore Oil Pollution (Message from President Nixon to Congress),
W72-09486 6E

President Nixon asks Senate Approval of Conventions on Pollution of the Sea by Oil,
W72-09485 6E

President's Message--Environmental Protection,
W72-09460 6E

NONAKA, A.
Gas-Solid Chromatography of Organic Compounds using Steam as the Carrier Gas,
W72-09566 5A

NYBORG, G.
Improved Continuous Radio Gas Chromatography of Hydrogen-3-- and Carbon-14--Labelled Compounds Using Hydrocracking,
W72-09352 5A

O'CONNER, J. S.
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

O'CONNOR, J. S.
The Benthic Macrofauna of Moriches Bay, New York,
W72-09181 5C

ODOM, J. J. JR
Process for Removal of Inorganic and Organic Matter from Waste Water Systems,
W72-09500 5D

ODUM, W. E.
Insidious Alteration of the Estuarine Environment,
W72-09717 5C

OEN, C. J.
Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

OERTLI, J. J.
Advancing Frontiers of Plant Sciences, Vol. 27. A Whole-System Approach to Water Physiology in Plants,
W72-09523 2I

OHASHI, K.
Flow Measurements of Ice-Covered Rivers in Hokkaido,
W72-09628 2C

OLESON, K. A.
Comparison of Evaporative Losses in Various Condenser Cooling Water Systems,
W72-09735 2D

OLIVEIRA, D. P.
Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

OLIVER, S. R.
Malacological Resources of the Gulf of San Matias with some Observations made in the Exploratory Campaign SAO-I-71,
W72-09708 2L

OLSEN, S.
Ecological Dynamics of Watersheds,
W72-09565 2A

ORESHKINA, N. S.
Moisture Variations in a Model Sod-Podzolic Soil (O nekotorykh zakonomernostyakh var-'irovaniya vlazhnosti v model'noy dernovo-podzolistoy pochve),
W72-09748 2G

ORLOV, A. D.
Water Erosion of Soils in the Ob' River Region Near Novosibirsk (Vodnaya eroziya pochv Novosibirskogo Priob'ya),
W72-09281 2J

ORLOVA, L. A.
Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

OSBORNE, B. F.
A Practical On-Stream Particle Size Analysis System,
W72-09372 7B

OTA, M.
The Characteristics of Residues in Spent Chlorination Liquor,
W72-09592 5D

OUDSHOORN, H. M.
Ice Cover Formation and Associated Hydro-Dynamic Effects in the Lower Part of the River Rhine,
W72-09634 2C

OWEN, D. B.
On Bias Reduction in Estimation,
W72-09358 7C

OYA, V.
Changed Resistance of Aspen Mesophyll as a Response to Rapid Leaf Drying, (In Russian),
W72-09775 2D

OZINKOVSKAYA, S. P.
Causes of Number Variation in Replenishment of the Kakhovka Reservoir Carp School, (In Russian),
W72-09202 2H

PAIJMANS, K.
An Analysis of Four Tropical Rain Forest Sites in New Guinea,
W72-09576 2I

PAIK, I. K.
Economic Information for Environmental Quality Management,
W72-09147 6G

PAINE, M. D.
Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

PAKKALA, I. S.
A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

PALIN, A. T.
The Application to Existing Plant of Recent Developments in Water Filtration,
W72-09689 5F

PAN, B. Y. K.
More Accurate Gas-Chromatographic Analysis Using Flame-Ionization Detector,
W72-09373 5A

PAN, P.
Growth of Obligate Autotrophic Bacteria on Glucose in a Continuous Flow-Through Apparatus,
W72-09318 5C

PANYCHEV, V. A.
Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

PAPAMARCOS, J.
New Incentives for Underground Transmission,
W72-09186 8C

PAPE, B. E.
Photochemistry of Bioactive Compounds. Solution-Phase Photochemistry of Asymmetric Triazin-5 (4H)-Ones,
W72-09250 5B

PARIS, D. F.
The Interrelation of Carbon and Phosphorus in Regulating Heterotrophic and Autotrophic Populations in an Aquatic Ecosystem, Shriner's Pond,
W72-09159 5C

PARK, R.
Seismic Resistance of Prestressed Concrete Beam-Column Assemblies,
W72-09713 8F

PATTERSON, W. B. JR
Oil Slick Elimination,
W72-09501 5G

PATYK-KARA, N. G.
New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

PEACE, R. R. JR
Geology and Ground-Water Resources of Northwestern North Carolina,
W72-09264 4B

PEETERS, E.
Radioactive and Metallic (Copper and Zinc) Pollutants in the Scheldt Estuary (in Water, Sediment and Suspended Matter), (Les Polluants Radioactifs et Metalliques (Cuivre et Zinc) dans L'Estuaire De L'Escaut (Eaux, Sediments et Matieres en Suspension)),
W72-09455 5A

PERGOLA, F.
Electro-Oxidation of Iodine on Smooth Platinum in Aqueous Media,
W72-09245 5A

PERRET, W. S.
Catches of Postlarval White Shrimp, 'Penaeus setiferus' (Linn.), and Brown Shrimp, P. aztecus ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967,
W72-09674 2L

PERRY, S. G.
Displacement Chromatography of Hydrocarbons,
W72-09563 5A

PERUYEVA, YE. G.
Some Quantitative Feeding Patterns Exhibited by the Copepod Calanus,
W72-09248 5C

PESCOD, M. B.
The Ozonization of Turret and Other Scottish Waters,
W72-09690 5F

PETHYBRIDGE, A. D.
Ion Association and the Analysis of Precise Conductimetric Data,
W72-09544 2K

PETROV, G. S.
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii posledнego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

PETTINATO, S.
Geologic and Hydrologic Study of Northern Sardinia: Report Number 3. The Provision of Water for the Region of Anglona, (In Italian),
W72-09781 6D

PHELPS, C. T.
Charging of Droplets by Impulse Corona,
W72-09212 2B

Field-Enhanced Propagation of Positive Streamers and Implications to Electrically Influenced Droplet Coalescence,
W72-09213 2B

PHELPS, P. L.
Sampling and Analytical Systems for Measuring Environmental Radioactivity,
W72-09453 5A

PHILLIPS, P. J.
Effect of Osmotic and Matric Potentials on the Availability of Water for Seed Germination,
W72-09773 2I

PIERSON, D. H.
Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

PILLAI, S. C.
Phosphorus in Wastewater Effluents and Algal Growth,
W72-09176 5C

PILSON, M. E. Q.
Arsenate in the Western North Atlantic and Adjacent Regions,
W72-09249 5A

PINKASOV, Y. I.
Effects of Water Deficiency on Transfer of Assimilates From Leaves Into Fruit Organs of Cotton, (In Russian),
W72-09776 3F

PIRT, S. J.
Introductory Lecture: Prospects and Problems in Continuous Flow Culture of Micro-Organisms,
W72-09341 5C

PISHARODY, P. N.
Response of Rice to Phosphate Manuring in a Waterlogged Lateritic Sandy Loam of Kerala,
W72-09578 3F

PITTMAN, F. K.
Plan for the Management of AEC-Generated Radioactive Wastes,
W72-09424 5G

PLANTER, M.
Elution of Mineral Components Out of Dead Reed Phragmites communis Trin,
W72-09778 2H

PLATO, A.
Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

PLEBUCH, R. O.
Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

POCKLINGTON, R.
Determination of Nanomolar Quantities of Free Amino Acids Dissolved in North Atlantic Ocean Waters,
W72-09343 5A

POLOLEDO, D.
Determination of Nitrilotriacetic acid in Inland Waters by Gas Chromatography of the Trimethyl Ester,
W72-09711 5A

POLOSUO, E.
The Structure of an Ice Ridge in the Baltic,
W72-09640 2C

POMEROY, L. R.
Nutrient Flux in Estuaries,
W72-09172 5C

PORTER, M. L.
A Method for the Analysis of Fish, Animal, and Pultry Tissue for Chlorinated Pesticide Residues,
W72-09684 5A

PORTERFIELD, G.
An Inventory of Published and Unpublished Fluvial-Sediment Data for California, 1956-70,
W72-09542 2J

PORTMANN, J. E.
Monitoring Metals in Marine Animals,
W72-09718 5A

POTTS, R. W.
Condenser Selection for Various Cooling Water Systems,
W72-09739 5D

POWERS, C. F.
Algal Responses to Nutrient Additions in Natural Waters. II. Field Experiments,
W72-09165 5C

PRATT, B. J.
Estimating Soil Moisture Depletion from Climate, Crop and Soil Data,
W72-09223 2G

PREHN, W. L. JR
The Potential Contribution of Desalting to Future Water Supply in New Mexico,
W72-09306 3A

PRITCHARD, D. W.
A Three-Dimensional Current Meter for Estuarine Applications,
W72-09334 2L

PROCHAZKA, H.
Determination of Environmental Radioactivity by Liquid-Scintillation Spectrometry,
W72-09448 5A

PROKOF'EV, A. A.
Effects of Water Deficiency on Transfer of Assimilates From Leaves Into Fruit Organs of Cotton, (In Russian),
W72-09776 3F

PROSPERI, T.
A Comparison of Some Ready-For-Use Thin Layers for the Separation of Heavy Metals with Butanol-3 N HCl,
W72-09353 5A

PRUE, J. E.
Ion Association and the Analysis of Precise Conductimetric Data,
W72-09544 2K

RADFORD, D. S.
A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

RAMANO, A. H.
Studies on Actinomycetes and Their Odors,
W72-09696 5F

RAMSEIER, R. E.
Testing New Sewer Pipe Installations,
W72-09595 5D

RAMSEIER, R. O.
Formation of Primary Ice Layers,
W72-09635 2C

RANDALL, C. W.
Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

RAO, K. M.
Estimation of the Occurrence of Hail and Hailstone Sizes,
W72-09206 2B

Theory of Hail Growth,
W72-09205 2B

RAPAIRE, J. L.
A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

RAPP, R. R.
Some Economic Aspects of Rain Stimulation,
W72-09146 3B

RASPI, G.
Electro-Oxidation of Iodine on Smooth Platinum in Aqueous Media,
W72-09245 5A

RECHNITZ, G. A.
Selectivity of Cyclic Polyether Type Liquid Membrane Electrodes,
W72-09415 5A

RECHT, H. L.
Phosphate Precipitation with Ferrous Iron,
W72-09388 5D

REES, J. S.
Effects of Organochlorine Insecticides on Bacterial Growth, Respiration and Viability,
W72-09361 5C

REHBERG, R.
Response of Escherichia Coli B/r to High Concentrations of Sucrose in a Nutrient Medium,
W72-09364 5C

REIMOLD, R. J.
Nutrient Flux in Estuaries,
W72-09172 5C

REIN, D. A.
Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

RICCA, V. T.
Hydrologic Investigation of Small Watersheds in Ohio, Phase I: 1966-1969,
W72-09296 2A

RIGGS, W. M.
Rapid Photochemical Determination of Uranium (VI) At Trace Levels,
W72-09254 5A

RIPPINGALE, R. J.
Interspecies Conflict in Estuarine Copepods,
W72-09231 2L

RIST, S.
Ice Conditions in the Thjorsa River System,
W72-09641 2C

River and Coastal Ice Problems in Iceland,
W72-09624 2C

ROBBINS, J. W. D.
Quality of Effluent from Swine Production Areas,
W72-09151 5B

ROBERTS, D. R.
Effects of Polymer Formulations of Dursban and Abate on Non-Target Organism Populations, April - October, 1970,
W72-09721 5C

ROBERTS, L. W.
Polymer Formulations of Dursban and Abate as Mosquito Larvicides, April - October, 1970,
W72-09720 5B

ROBERTSON, J. M.
Stream Turbulence Effects on Turbulent Boundary Layer,
W72-09257 2E

ROBINSON, K.
The Role of the Diffuse Layer in Water-In-Oil Microemulsions,
W72-09335 5A

ROBISON, W. L.
Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

ROEHM, L. H.
Comparison of Computed and Measured Dynamic Response of Monticello Dam,
W72-09198 8A

ROGERS, W. P.
President Nixon asks Senate Approval of Conventions on Pollution of the Sea by Oil,
W72-09485 6E

ROHLICH, G. A.
Wastewater Treatment and Eutrophication,
W72-09170 5C

RONK, R. J.
Heavy Metals in United States Fish,
W72-09719 5B

ROPES, J. W.
Data on Samples for Surf Clams and Ocean Quahogs,
W72-09521 7C

ROSEN, J. M.
Analysis of Explosives in Sea Water,
W72-09312 5A

ROSENTHAL, H.
Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

ROSTVEDT, J. O.
Summary of Floods in the United States During 1967,
W72-09222 2E

ROUBAL, R. K.
Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

ROUTH, J. D.
DDT Residues in Salinas River Sediments,
W72-09313 5B

RUFF, L. E.
Pollution Prices in a General Equilibrium Model,
W72-09235 5G

RUPNICK, E. J.
Apparatus for Controlling the Dispersion of Pollutants Floating on a Body of Water,
W72-09494 5G

RUTHERFORD, R. J.
Water Budget Analysis of a New England Wetland,
W72-09265 3B

RYAN, R. T.
Eyewitness Tornado Observations Obtained with Telephone and Tape Recorder,
W72-09217 2B

Miniature Whirlwinds Produced in the Laboratory by High-Voltage Electrical Discharges,
W72-09216 2B

RYTHER, J. H.
Controlled Eutrophication-Increasing Food Production from the Sea by Recycling Human Wastes,
W72-09378 5G

SAFFERMAN, R. S.
Studies on Actinomycetes and Their Odors,
W72-09696 5F

SAIKI, M.
Measurements of 89Sr and 90Sr in Environmental Samples by a Low-Background Beta-Ray Spectrometer,
W72-09450 5A

SAKATO, K.
Studies on a Piscicidal Constituent of Hura crepitans: I. Isolation and Characterization of Huratoxin and its Piscicidal Activity,
W72-09779 5C

SALMON, L.
Rapid Evaluation of Radioactive Samples by Gamma-Ray Spectrometry,
W72-09446 5A

SANSONI, B.
Rapid Methods for Radioactive Environmental Monitoring in the Federal Republic of Germany, (Schnellmethoden Zur Uberwachung Der Radioaktivitat in Der Bundesrepublik Deutschland),
W72-09456 5A

SARGENT, D. F.
Light-Induced Inhibition of Respiration in DCMU-Poisoned Chlorella by Photosystem I Activity,
W72-09178 5C

SAVAN, M.
Infectious Pancreatic Necrosis Virus: Comparative Frequencies of Isolation From Feces and Organs of Brook Trout (Salvelinus fontinalis),
W72-09152 5A

SAWYER, CLAIR N.
Factors Affecting Nitrification Kinetics,
W72-09174 5D

SAYRE, W. W.
Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

SCHEIE, P. O.
Response of Escherichia Coli B/r to High Concentrations of Sucrose in a Nutrient Medium,
W72-09364 5C

SCHELSKE, C. L.
Phosphorus, Silica, and Eutrophication of Lake Michigan,
W72-09166 5C

SCHILLER, R.
Kinetics of OH Radical Reactions in Irradiated Ordinary and Supercooled Water,
W72-09428 5B

SCHMIDT, K.
Wastewater Demineralization by Ion Exchange,
W72-09384 5D

SCHNEIDER, G. R.
Instrumentation for In-Situ Determination of Ice Particle Size Distribution,
W72-09513 3A

SCHNEIDER, K. J.
Present Status of the U.S. Program on the Solidification of High Level Wastes,
W72-09584 5D

SCHOELLER, M.
Geochemical Study of the Ground Water of the 'Sables Inferieurs' Confined Aquifer, of the Aquitaine Basin (Etude Geochimique de la Nappe des 'Sables Inferieurs' du Bassin d'Aquitaine),
W72-09269 2F

SCHOENGOLD, D. M.
Simple Device for Introduction of Mass Calibrant into a Gas Chromatograph-Mass Spectrometer System,
W72-09323 2K

SCHRECK, C. B.
Trouts of the Upper Kern River Basin, California, with Reference to Systematics and Evolution of Western North American Salmo,
W72-09515 2E

SCHREIBER, H. A.
Available Soil Water: Time-Distribution in a Warm Season Rangeland,
W72-09271 2A

SCHUCANY, W. R.
On Bias Reduction in Estimation,
W72-09358 7C

SCHULDT, M. D.
Algal Responses to Nutrient Additions in Natural Waters. II. Field Experiments,
W72-09165 5C

SCHULTS, D. W.
Algal Responses to Nutrient Additions in Natural Waters. II. Field Experiments,
W72-09165 5C

SCHULZE, E. D.
Responses of Stomata to Changes in Humidity,
W72-09783 2D

SCHUTTELKOPF, H.
Determination of Plutonium in Environmental Surveillance Samples,
W72-09441 5A

SCOTT, D.
Possible DDT Mortality in Young Rainbow Trout,
W72-09141 5C

SEARS, J. P.
Possible Effects of Organochlorine Pesticides on Primary Productivity and Skeletogenesis of New England Estuarine and Coastal Marine Algae,
W72-09653 5C

SEIBER, J. N.
Hydrolysis and Solvent Partition of Phosdrin and Related Organophosphates,
W72-09321 5B

SEIDEL, A.
Rapid Determination of Some Transuranium Elements in Biological Material by Liquid Scintillation Counting,
W72-09354 5A

SEIDENBERG, A. J.
A New Species of Troglobitic Asellid From Illinois,
W72-09520 5C

SELIGER, H. H.
Bioluminescence and Primary Productivity in Marine Estuarine Environments,
W72-09575 5C

SELLECK, R. E.
Toxicity Assessment of Treated Municipal Wastewaters,
W72-09582 5D

SERNAU, R.
Natural Carbon Sources, Rates of Replenishment, and Algal Growth,
W72-09168 5C

SEYMOUR, A. H.
The Rate of Loss of Mercury by Pacific Oysters,
W72-09667 5A

SHAFFER, F. B.
Characteristics of Streamflow at Gaging Stations in Shell Creek, Elkhorn River, and Salt Creek Basins, Nebraska,
W72-09556 2E

SHAH, B. G.
Zinc Retention in Young Rats Fed Increasing Levels of High-Zinc Oysters,
W72-09716 5C

SHAH, S. P.
Tensile Tests of Ferrocement,
W72-09709 8F

Testing Methods for Concrete Durability,
W72-09702 8F

SHARP, M.
Organic Radical-Ion Salts as Selective Electrochemical Sensors,
W72-09366 5A

SHAYKEWICH, C. F.
Influence of Soil Water Matric Potential and Hydraulic Conductivity on the Germination of Rape (Brassica napus L.),
W72-09780 3F

SHEAIL, J.
The Formation and Maintenance of Water-Meadows in Hampshire, England,
W72-09707 4A

SHEETS, T. J.
Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

SHEIKH, K. H.
The Responses of Molinia Caerulea and Erica tetralix to Soil Aeration and Related Factors. III. Effects of Different Gas Concentrations on Growth in Solution Culture; and General Conclusions,
W72-09572 2I

SHEN, M. C.
Asymptotic Theory of Helical Waves on a Gaseous Jet in a Rotating Viscous Fluid,
W72-09237 2E

SHENTON, L. R.
Nutrient Flux in Estuaries,
W72-09172 5C

SHEPPE, W. OSBORNE
Patterns of Use of a Flood Plain by Zambian Mammals,
W72-09724 2I

SHERENKOV, I. A.
Concrete Blocks for Earth Slope Protection,
W72-09705 4A

SHIBATA, S.
Rapid and Simple Determination of 59Fe, 60Co, 65Zn, 137Cs, and 95Zr in Concentrated Salts Solutions,
W72-09440 5A

SHIKINA, M. I.
Methods for Clean Condensation of Atmospheric Moisture for Its Use in a Closed Ecological System,
W72-09583 5D

SHIMIZU, M.
Automatic Monitoring Method Using Biological Concentration for Marine Radioactive Contamination,
W72-09454 5A

SHIROYAMA, T.
Algal Responses to Nutrient Additions in Natural Waters. I. Laboratory Assays,
W72-09164 5C

SHRIER, A. L.
Removal of Inorganic Species by Liquid Membrane,
W72-09497 5D

SHUMAKER, T. P.
Process for Removal of Inorganic and Organic Matter from Waste Water Systems,
W72-09500 5D

SHUSTER, W. W.
Chemical-Physical Wastewater Treatment Phase 2: Activated Carbon Adsorption and Polishing,
W72-09302 5D

SIEBERS, D.
Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

SIEMS, P. L.
Migration and Leaching of Metals from Old Mine Tailings Deposits,
W72-09620 5B

SILL, C. W.
Rapid Identification and Determination of Alpha Emitters in Environmental Samples,
W72-09442 5A

SIMMONS, H.
The Potential of Physical Models to Investigate Estuarine Water Quality Problems,
W72-09548 5B

SIMON, J. L.
Animal-Sediment Relations and Community Analysis of a Florida Estuary,
W72-09177 5C

SIMPSON, J. R.
Development and Use of a Large-Volume Automatic Respirometer,
W72-09396 5D

The Effects of Oil on Sewers and Treatment Plants,
W72-09395 5D

SINGH, K. P.
Water Treatment Plant Staging Policy,
W72-09289 5F

SINGLEY, J. E.
Stoichiometry of the Coagulation of Color-Causing Organic Compounds with Ferric Sulfate,
W72-09695 5F

SINITSYN, V. I.
Experience in the Operation of the Bratsk Hydroelectric Plant,
W72-09703 8C

SINYAK, YU. YE.
Methods for Clean Condensation of Atmospheric Moisture for Its Use in a Closed Ecological System,
W72-09583 5D

SKIENS, W. E.
Development of Cellulose Triacetate Hollow Fiber Reverse Osmosis Modules for Brackish Water Desalination,
W72-09517 3A

SKLADNEV, M. F.
Concrete Blocks for Earth Slope Protection,
W72-09705 4A

SLACH, E.
Appearance of 1-Hydroxychlordene in Soil, Crops, and Fish,
W72-09317 5A

SLAVIN, S.
The Determination of Lead and Cadmium in Soils and Leaves by Atomic Absorption Spectroscopy,
W72-09331 5A

SLECHTA, A.
Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

SMENTOWSKI, F. J.
Lanthanide Shift Reagents as an Aid in the NMR Analysis of the Normal Alcohols C6 to C11,
W72-09347 5A

SMILES, D. E.
A Test of the Uniqueness of the Soil Moisture Characteristic During Transient, Nonhysteretic Flow of Water in a Rigid Soil,
W72-09183 2G

SMITH, E. C.
Power Plant Siting, Performance, and Economics with Dry Cooling Tower Systems,
W72-09741 5D

SMITH, E. J.
The Use of Sewage Effluent at South African Pulp and Paper Industries' Enstra Bleached Kraft Mill,
W72-09399 5D

SMITH, G. I.
Deuterium Content of Snow as an Index to Winter Climate in the Sierra Nevada Area,
W72-09622 2C

SMITH, L. D.
Factors Involved in the Isolation of Clostridium Perfringens,
W72-09370 5A

SMITHSON, G. R. JR
The Clarification of Paper Mill Effluents by Activated Carbon Produced from Waste Sulfite Liquor and Other Refuse,
W72-09589 5D

SMRCHEK, JERRY C.
Invertebrates Collected on and around Carroll Island, Maryland,
W72-09173 5C

SOLOW, R. M.
The Economist's Approach to Pollution and Its Control,
W72-09145 6C

SOMMERFELD, R. A.
The Relationship Between Density and Tensile Strength in Snow,
W72-09611 2C

SOROKIN, YU. I.
Bacterial Populations as Components of Oceanic Ecosystems,
W72-09351 5B

SPANGEMACHER, K.
Method and Apparatus for Withdrawing Heat from Industrial Plants, Especially Power Plants,
W72-09489 5D

SPANGLER, M. B.
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

SPARKS, R. E.
The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis Macrochirus raf.),
W72-09679 5C

SPENCER, A. T.
Experiments on the Generation of Raindrop-Size Distributions by Drop Breakup,
W72-09203 2B

SPENGLER, J. D.
Experimental Studies of Freezing, Wake Effect, and Breakup of Freely Suspended Supercooled Water Drops,
W72-09204 2B

Large Vertical Wind Tunnel for Hydrometeor Studies,
W72-09210 2B

SRINATH, E. G.
Phosphorus in Wastewater Effluents and Algal Growth,
W72-09176 5C

STACEY, G. S.
Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

STAKE, A. M.
Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

STANLEY, N. F.
Flotation of Solids from Waste Waters,
W72-09496 5D

STARUSHENKO, L. I.
Dynamics of the Fat Content in the Bodies of Mugil saliens Risso Grown in the Shabolatsky Estuary, (In Russian),
W72-09185 2L

STAYNES, T. M.
Operation of Bybrook Sewage Works, Ashford, Kent, 1965-68,
W72-09401 5D

STEELE, E. K. JR
Use of Groundwater for Irrigation in Clay County, Nebraska, 1970,
W72-09756 4B

STEEVES, H. R. III
A New Species of Troglobitic Asellid From Illinois,
W72-09520 5C

STELZER, R.
Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

STEPHEN, W. I.
The Determination of Traces of Nickel by Gas-Liquid Chromatography,
W72-09369 5A

STEVENS, H. H. JR
Studies of Sediment Transport in the Columbia River Estuary,
W72-09551 5B

STEWART, D. J.
A Composite Arginine Glucose Medium for the Characterization of Pseudomonas Aeruginosa and Other Gram Negative Bacilli,
W72-09320 5C

STEWART, W. H.
Simple Device for Introduction of Mass Calibrant into a Gas Chromatograph-Mass Spectrometer System,
W72-09323 2K

STICKLEY, D. P.
The Effect of Chloroform in Sewage on the Production of Gas From Laboratory Digesters,
W72-09398 5D

STIFF, M. J.
The Determination of Nitrilotriacetic Acid (NTA) In Sewage and Sewage Effluent,
W72-09251 5A

STIPANOVIC, R. D.
Lanthanide Shift Reagents as an Aid in the NMR Analysis of the Normal Alcohols C6 to C11,
W72-09347 5A

STIRTON, A. J.
The Biodegradation of Some Sulfated Alkanolamides,
W72-09344 5B

STOERMER, E. F.
Phosphorus, Silica, and Eutrophication of Lake Michigan,
W72-09166 5C

STOLBOV, V. F.
Methods for Clean Condensation of Atmospheric Moisture for Its Use in a Closed Ecological System,
W72-09583 5D

STOLZENBACH, K. D.
An Analytical and Experimental Investigation of Surface Discharges of Heated Water,
W72-09729 5B

STONKUS, V. V.
Gas-Liquid Chromatographic Determination of Furfural in Aqueous Solution,
W72-09403 5A

STOUT, R.
Mechanism of the Initial Events in the Sorption of Marine Bacteria to Surfaces,
W72-09568 5C

STRESKO, V.
Determination of Antimony in Geological Materials by Atomic Absorption Spectrometry,
W72-09328 5A

STROGANOV, N. S.
Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

STROMBERG, W. L.
The Relationships Between 32P Accumulation in Algae, Bacteria and Tubificids,
W72-09668 5C

STUMM, W.
Mechanism of Hydrogen Ion Buffering in Natural Waters,
W72-09687 5F

SUDILOVSKY, O.
Simple Device for Transferring and Eluting Thin-Layer Chromatographic Fractions,
W72-09342 2K

SUFFET, IRWIN H.
Thin Layer Chromatography and Infra-Red and Ultra-Violet Spectra of Fenthion and Seven of its Degradation Products,
W72-09182 5A

SUMNER, J. S.
Ground-Water Volumes from Anomalous Mass Determinations for Alluvial Basins,
W72-09619 2F

SUTTER, N. G.
Available Soil Water: Time-Distribution in a Warm Season Rangeland,
W72-09271 2A

SVIHEL, K.
Gas Chromatographic Analysis of the Higher Fatty Acids of the Alga Chlorella Vulgaris (Pyrenoidosa),
W72-09365 5A

SWAN, P. N.
International and National Approaches to Oil Pollution Responsibility: An Emerging Regime for a Global Problem,
W72-09467 5G

SWIFT, W. L.
Optimizing Hydraulic Turbine and Pump/Turbine Design,
W72-09710 8C

TACQUET, A.
Mycobacteria of Sewage Water and Sediment, (In French),
W72-09777 5A

TAIGANIDES, E. P.
Hydrologic Investigation of Small Watersheds in Ohio, Phase I: 1966-1969,
W72-09296 2A

TANAKA, E.
Role of Low-Background Beta-Ray Spectrometers for Rapid Assay of Environmental Samples,
W72-09447 5A

TANAKA, HIRARU
Study on the Toxicity of Agricultural Control Chemicals in Relation to Freshwater Fisheries Management: V. Some Effects of Sodium Pentachlorophenate to Freshwater Fishes,
W72-09184 5C

TAYLOR, C. P. S.
Light-Induced Inhibition of Respiration in DCMU-Poisoned Chlorella by Photosystem I Activity,
W72-09178 5C

TAZAWA, M.
Water Movement in a Plant Cell on Application of Hydrostatic Pressure,
W72-09786 2I

TEDROW, A. C.
Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

TEMPLETON, W. L.
Methods for Evaluating Effects of Transient Conditions in Heavily Loaded and Extensively Regulated Streams,
W72-09731 5B

TENORE, K. R.
Controlled Eutrophication-Increasing Food Production from the Sea by Recycling Human Wastes,
W72-09378 5G

TESAKER, E.
Measurements of Ice Roughness and the Effect of Ice Cover on Water Levels in Three Norwegian Rivers,
W72-09638 2C

THOMAS, J. P.
Release of Dissolved Organic Matter from Natural Populations of Marine Phytoplankton,
W72-09363 5C

THOMAS, K. L.
Comparison of Methods of Estimating the Number of Escherichia coli in Edible Mussels and the Relationship between the Presence of Salmonellae and E. coli,
W72-09319 5A

THOMPSON, D. M.
Hazelwood Power Station - Data Collection and Analysis of Cooling Pond Performance,
W72-09737 5D

THOMPSON, G.
Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

THORSLUND, A. E.
Potential Uses of Waste Waters and Heated Effluents,
W72-09733 5B

TOETZ, D. W.
Diurnal Uptake of NO3 and NH4 by a Ceratophyllum-Periphyton Community,
W72-09406 5C

TOFFLEMIRE, T. J.
Chemical-Physical Wastewater Treatment Phase 2: Activated Carbon Adsorption and Polishing,
W72-09302 5D

TOKIWA, F.
Nuclear Magnetic Resonance Study of Interaction between Anionic and Nonionic Surfactants in their Mixed Micelles,
W72-09410 5A

TOUREAU, A. E. R.
Rapid Evaluation of Radioactive Samples by Gamma-Ray Spectrometry,
W72-09446 5A

TRAINER, D. G.
Notes on the Biology of Pygospio Elegans from Maine,
W72-09685 5C

TRAPP, H. JR
Availability of Ground Water for Public-Water Supply in the Pensacola Area, Florida,
W72-09267 4B

TRITREMMEL, C.
A Quick and Convenient Measurement Method for Surface and Liquid Contamination Using the TLD System,
W72-09451 5A

TROTT, T.
Sunlight Photochemistry of Ferric Nitrilotriacetate Complexes,
W72-09379 5A

TRUDGILL, P. W.
Effects of Organochlorine Insecticides on Bacterial Growth, Respiration and Viability,
W72-09361 5C

TSANG, G.
Change of Velocity Distribution in a Cross-Section of a Freezing River and the Effect of Frazil Ice Loading on Velocity Distribution,
W72-09636 2C

TSUJII, K.
Nuclear Magnetic Resonance Study of Interaction between Anionic and Nonionic Surfactants in their Mixed Micelles,
W72-09410 5A

UDEN, P. C.
The Determination of Traces of Nickel by Gas-Liquid Chromatography,
W72-09369 5A

ULRIKSON, G. U.
Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

UMAROV, M. U.
Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

UMBREIT, W. W.
Growth of Obligate Autotrophic Bacteria on Glucose in a Continuous Flow-Through Apparatus,
W72-09318 5C

UNZ, R. F.
Microbiological Characterization of Activated Sludge in a Wastewater Treatment Plant Chemically Modified for Phosphorous Removal,
W72-09654 5D

UTTORMARK, P. D.
Wastewater Treatment and Eutrophication,
W72-09170 5C

VACHAUD, GEORGES
A Test of the Uniqueness of the Soil Moisture Characteristic During Transient, Nonhysteretic Flow of Water in a Rigid Soil,
W72-09183 2G

VALLICOTT, D. R.
Role of the Soil Conservation Service in Design of Feedlot Waste Management Facilities,
W72-09149 5G

VAN WINKLE, R.
Variable Orifice for Multistage Flash Evaporation or Distillation Units,
W72-09487 3A

VARSHNEY, C. K.
Water Pollution in Delhi Lakes,
W72-09175 5C

VAUCLIN, MICHEL
A Test of the Uniqueness of the Soil Moisture Characteristic During Transient, Nonhysteretic Flow of Water in a Rigid Soil,
W72-09183 2G

VELD, C. I.
Separator for Nonmiscible Liquids,
W72-09509 5G

VELICKEVICH, F. YU.
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

VENRICK, E. L.
The Statistics of Subsampling,
W72-09416 7B

VENTERS, A.
Variations of Sulfur Isotope Ratios in Samples of Water and Air near Chicago,
W72-09336 5B

VERNON, F.
The Spectrofluorimetric Determination of Sulphide,
W72-09253 5A

VOGEL, J. C.
Natural Isotopes in the Groundwater of the Tulum Valley, San Juan, Argentina,
W72-09276 2F

VOLF, V.
Rapid Determination of Some Transuranium Elements in Biological Material by Liquid Scintillation Counting,
W72-09354 5A

VONNEGUT, B.
Charging of Droplets by Impulse Corona,
W72-09212 2B

The Design, Construction, and Use of an Ice Crystal Counter for Ice Crystal Cloud Studies by Aircraft,
W72-09209 2B

Eyewitness Tornado Observations Obtained with Telephone and Tape Recorder,
W72-09217 2B

Miniature Whirlwinds Produced in the Laboratory by High-Voltage Electrical Discharges,
W72-09216 2B

An Optical Lightning Detector,
W72-09208 2B

Point Discharge Current in Blackwell, Oklahoma, June 1969 - September 1970,
W72-09218 2B

Structure and Modification of Clouds and Fogs,
W72-09201 2B

VOZNYACHUK, L. N.
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

VROCHINSKIY, K. K.
Effects of Pesticides on the Life of a Water Body (K voprosu o vliyanii pestitsidov na zhizn' vodoyema),
W72-09651 5C

WALLACE, G. B.
New Techniques for Quality Control of Concrete,
W72-09712 8F

WALSH, D. F.
Effects of Malathion on Two Warm-Water Fishes and Aquatic Invertebrates in Ponds,
W72-09567 5C

WATKINS, R.
Determination of Copper, Iron, and Zinc From a Single Small Sample,
W72-09243 5A

WEAKLY, E. C.
Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

WEBB, M. G.
Boom for Oil Spilt on Water,
W72-09495 5G

WEBER, W. J. JR
Mechanism of Hydrogen Ion Buffering in Natural Waters,
W72-09687 5F

WEEKS, W. F.
The Morphlogy and Physical Properties of Pressure Ridges: Barrow, Alaska, April 1969,
W72-09639 2C

WEINER, M.
Determination of Copper, Iron, and Zinc From a Single Small Sample,
W72-09243 5A

WELFORD, G. A.
Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

WEST, R. E.
Ground-Water Volumes from Anomalous Mass Determinations for Alluvial Basins,
W72-09619 2F

WETMORE, A.
Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

WETZEL, R. G.
The Role of Carbon in Hard-Water Marl Lakes,
W72-09161 5C

WHEATSTONE, K. C.
Analysis of Small Quantities of Saccharides in Aqueous Effluents,
W72-09419 5A

WHIPPLE, W. JR
Aeration Systems for Large Navigable Rivers,
W72-09196 5G

WHITE, L. P.
Vegetation Stripes on Sheet Wash Surfaces,
W72-09307 2I

WHITE, M. N.
A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

WHITESIDES, D. V.
Float Implosion in Observation Well in Kentucky,
W72-09621 4B

WHITHAM, P.
The Spectrofluorimetric Determination of Sulphide,
W72-09253 5A

WHITMAN, R. V.
Resistance of Soil to Liquefaction and Settlement,
W72-09704 8D

WHITTLE, G. P.
Stoichiometry of the Coagulation of Color-Causing Organic Compounds with Ferric Sulfate,
W72-09695 5F

WHITTLESEY, N. K.
Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

WIDDUS, R.
Effects of Organochlorine Insecticides on Bacterial Growth, Respiration and Viability,
W72-09361 5C

WIGLE, T. E.
Investigations into Frazil, Bottom Ice and Surface Ice Formation in the Niagara River,
W72-09632 2C

WILBER, C. G.
Polluted Water: A Challenge to Forensic Biology,
W72-09498 5G

WILD, HARRY E. JR
Factors Affecting Nitrification Kinetics,
W72-09174 5D

WILKINSON, D. L.
Dynamics of Contained Oil Slicks,
W72-09258 5G

WILKINSON, R. J.
Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

WILLA, O. JR
Nutrient Management in the Potomac Estuary,
W72-09171 5C

WILLARDSON, L. S.
Interceptor Drain Recovery of Canal Seepage,
W72-09197 8A

WILLIAMS, G. P.
Break-Up and Control of River Ice,
W72-09642 2C

WILLIAMS, J.
Influence of Soil Water Matric Potential and Hydraulic Conductivity on the Germination of Rape (Brassica napus L.),
W72-09780 3F

WILLIAMS, M. C.
Status of Weather Modification in Watershed Management,
W72-09189 3B

WILLIAMS, P. B.
Initiation of Ripples by Artificial Disturbances,
W72-09260 2J

WILLIAMS, R. E.
Migration and Leaching of Metals from Old Mine Tailings Deposits,
W72-09620 5B

WILLIAMS, R. L.
Rapid Identification and Determination of Alpha Emitters in Environmental Samples,
W72-09442 5A

WILSON, J. C.
Capital and Operating Costs--AWT,
W72-09140 5D

WISEMAN, W. J. JR
A Three-Dimensional Current Meter for Estuarine Applications,
W72-09334 2L

WITT, B. E.
Biochemical Process,
W72-09502 5D

WITT, E.
Flocculation of Particles Dispersed in Aqueous Media and Flocculants Used Therein,
W72-09505 5D

WNEK, W. J.
Mathematical Model for Fate of Pollutants in Near-Shore Waters,
W72-09377 5B

WOLD, J. L.
Emergence Trap Collections of Trichoptera from an Oregon Stream,
W72-09571 5A

WOLFE, D. A.
Fallout Cesium-137 in Clams (Rangia Cuneata) From the Neuse River Estuary, North Carolina,
W72-09337 5A

WOLMAN, M. G.
The Nation's Rivers,
W72-09188 5G

WOLTER, R.
Rapid Determination of Gamma-Ray Emitting Radionuclides in Water (Schnelle Bestimmung Gammastrahlender Radionuklide in Wassern),
W72-09445 5A

WRIGHT, J. L.
Estimating Soil Moisture Depletion from Climate, Crop and Soil Data,
W72-09223 2G

WRUBLE, D. T.
Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

WURSTER, C. F.
Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

WYNNE, R. H. JR
Crystal Seed Conditioning of Calcium Carbonate Sludge,
W72-09392 5F

YAMAGATA, N.
Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

YAMAMOTO, T.
Automatic Monitoring Method Using Biological Concentration for Marine Radioactive Contamination,
W72-09454 5A

YEMEL'YANOV, YE. M.
Distribution and Composition of Carbonates in the Upper Layer of Bottom Sediments of the Atlantic Ocean (Raspredelenive i sostav karbonatov v verkhnem sloye donnykh osadkov Atlanticheskogo okeana),
W72-09256 2J

YENTSCH, C.
Possible Effects of Organochlorine Pesticides on Primary Productivity and Skeletogenesis of New England Estuarine and Coastal Marine Algae,
W72-09653 5C

YERGER, R. W.
Ecology and Life History of the Diamond Killifish: Adinia xenica (Jordan and Gilbert),
W72-09360 2L

YOKOTE, MOTOYOSHI
Study on the Toxicity of Agricultural Control Chemicals in Relation to Freshwater Fisheries Management: V. Some Effects of Sodium Pentachlorophenate to Freshwater Fishes,
W72-09184 5C

YOUNG, D. K.
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

YOUNG, D. R.
The Distribution of Cesium, Rubidium, and Potassium in the Quasi-Marine Ecosystem of the Salton Sea,
W72-09574 5B

YOUNG, S. J. V.
A Method for the Analysis of Fish, Animal, and Pultry Tissue for Chlorinated Pesticide Residues,
W72-09684 5A

Micro Scale Alkali Treatment for use in Pesticide Residue Confirmation and Sample Cleanup,
W72-09314 5A

YOUNGS, E. G.
Two- and Three-Dimensional Infiltration: Seepage From Irrigation Channels and Infiltrometer Rings,
W72-09270 4A

YOUNGS, W. D.
Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

YU, S. L.
Aeration Systems for Large Navigable Rivers,
W72-09196 5G

ZABIK, M. J.
Photochemistry of Bioactive Compounds. Solution-Phase Photochemistry of Asymmetric Triazin-5 (4H)-Ones,
W72-09250 5B

ZAIKA, V. YE.
Relationship between the Productivity of Marine Mollusks and Their Life-Span,
W72-09569 5C

ZAK, B.
Determination of Copper, Iron, and Zinc From a Single Small Sample,
W72-09243 5A

ZILKA, L.
Gas Chromatographic Analysis of the Higher Fatty Acids of the Alga Chlorella Vulgaris (Pyrenoidosa),
W72-09365 5A

ZINGMARK, R.
The Santa Barbara Oil Spill Part 2: Initial Effects on Intertidal and Kelp Bed Organisms,
W72-09683 5C

ZIRINO, A.
Voltammetric Measurement of Zinc in the Northeastern Tropical Pacific Ocean,
W72-09413 5A

ZUCKERMAN, M. M.
System for Measuring Organic Content of Water,
W72-09493 5D

Waste Water Treatment Process,
W72-09492 5D

ZUKHUROV, N.
Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

ZYUZ', N. S.
Moisture Content of Hummocky Sands Under Pine Plantings in the Middle Don Region (Vlazhnost'bugristykh peskov pod sosnovymi nasazhdeniyami na srednem Donu),
W72-09749 2G

ORGANIZATIONAL INDEX

AARHUS UNIV., (DENMARK). INST. OF PHYSIOLOGY.
The Determination of Calcium in the 0.1 to 10 NG Region by Atomic Absorption Spectroscopy with the Heated Graphite Atomizer,
W72-09329 5A

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, PA. DEPT. OF LIMNOLOGY.
Environmental Control of the Abundance and Distribution of the Chydorid Cladocera,
W72-09458 2H

AGRICULTURAL RESEARCH COUNCIL, CAMBRIDGE (ENGLAND). UNIT OF SOIL PHYSICS.
Two- and Three-Dimensional Infiltration: Seepage From Irrigation Channels and Infiltrometer Rings,
W72-09270 4A

AGRICULTURAL RESEARCH INST., KARNOBAT (BULGARIA).
Perennial Grass Mixtures for Hay-Pasture Use of Low-Productive and Eroded Lands Under Dry Farming Conditions, (In Bulgarian),
W72-09772 3F

AGRICULTURAL RESEARCH SERVICE, BRAWLEY, CALIF.; AND IMPERIAL IRRIGATION DISTRICT, CALIF.; AND AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.
Interceptor Drain Recovery of Canal Seepage,
W72-09197 8A

AGRICULTURAL RESEARCH SERVICE, KIMBERLY, IDAHO. SNAKE RIVER RESEARCH CENTER.
Estimating Soil Moisture Depletion from Climate, Crop and Soil Data,
W72-09223 2G

AGRICULTURAL RESEARCH SERVICE, TUCSON, ARIZ. SOUTHWEST WATERSHED RESEARCH CENTER.
Available Soil Water: Time-Distribution in a Warm Season Rangeland,
W72-09271 2A

AIR PREHEATER CO., INC., WELLSVILLE, N.Y. (ASSIGNEE).
Floating Oil Containment Apparatus,
W72-09508 5G

AIR RESOURCES ATMOSPHERIC TURBULENCE AND DIFFUSION LAB., OAK RIDGE, TENN.
Meteorological Effects of Cooling Tower Plumes,
W72-09305 2B

AKADEMIYA NAUK ARMYANSKOI SSR, EREVAN. INSTITUT GEOLOGICHESKIKH NAUK.
Atmospheric Precipitation in the Armenian SSR (Atmosfernyye osadki v Armyanskoy SSR),
W72-09746 2B

AKADEMIYA NAUK AZERBAIDZHANSKOI SSR, BAKU. INSTITUT GEOGRAFII.
Formation of Heavy Precipitation in the Central Steppe Xone of the Azerbaydzhan (Usloviya formirovaniya znachitel'nykh osadkov nad tsentral'nostepnoy zonoy Azerbaydzhanskoy SSR),
W72-09745 2B

AKADEMIYA NAUK ESTONSKOI SSR, TARTU. INSTITUT FIZIKI I ASTRONOMII.
Changed Resistance of Aspen Mesophyll as a Response to Rapid Leaf Drying, (In Russian),
W72-09775 2D

Model of Plant Productivity at Limited Water Supply Considering Adaptation,
W72-09782 2I

AKADEMIYA NAUK LATVIISKOI SSR, RIGA. INST. OF ORGANIC SYNTHESIS.
Gas-Liquid Chromatographic Determination of Furfural in Aqueous Solution,
W72-09403 5A

AKADEMIYA NAUK SSSR, KALININGRAD. INSTITUT OKEANOLOGII.
Some Quantitative Feeding Patterns Exhibited by the Copepod Calanus,
W72-09248 5C

Distribution and Composition of Carbonates in the Upper Layer of Bottom Sediments of the Atlantic Ocean (Raspredelenive i sostav karbonatov v verkhnem sloye donnykh osadkov Atlanticheskogo okeana),
W72-09256 2J

AKADEMIYA NAUK SSSR, MOSCOW. GEOLOGICHESKII INSTITUT.
Geologic Age of Ancient Lake Sediments of the Mologo-Sheksna Depression (O geologicheskom vozraste drevneozernykh otlozheniy Mologo-Sheksninskoy niziny),
W72-09284 2J

AKADEMIYA NAUK SSSR, MOSCOW. INST. OF PLANT PHYSIOLOGY.
Effects of Water Deficiency on Transfer of Assimilates From Leaves Into Fruit Organs of Cotton, (In Russian),
W72-09776 3F

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT BIOLOGII VNUTRENNYKH VOD.
Bacterial Populations as Components of Oceanic Ecosystems,
W72-09351 5B

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT GEOKHIMII I ANALITICHESKOI KHIMII.
Emanations from Soil as a Function of Moisture Content (Zavisimost' emanirovaniya pochv ot vlazhnosti),
W72-09742 2G

AKADEMIYA NAUK SSSR, NOVOSIBIRSK. INSTITUT GEOLOGII I GEOFIZIKI.
Radiocarbon Dating of Terraces of the Upper Ob' Region (Altay Piedmont Plain) (Radiouglerodnyye datirovki terras verkhnego Priob'ya (Predaltayskaya ravnina)),
W72-09285 2J

AKADEMIYA NAUK SSSR, UFA. BASHIRSKII FILIAL.
Study of Crude Oil and Some of its High Molecular Compounds Using Electron Paramagnetic Resonance (Review),
W72-09404 5A

AKADEMIYA NAUK URSR, KIEV. INSTYTUT HIDROBIOLOGII.
Problem of Pesticides in Water Toxicology (Problema pestitsidov v vodnoy toksikologii),
W72-09650 5C

AKRON UNIV., OHIO. DEPT. OF BIOLOGY.
Patterns of Use of a Flood Plain by Zambian Mammals,
W72-09724 2I

ALAMO AREA COUNCIL OF GOVERNMENTS, SAN ANTONIO, TEX.
Basin Management for Water Reuse.
W72-09381 5D

ALASKA STATE DEPT. OF HEALTH AND WELFARE, COLLEGE.
Arctic Waste Management,
W72-09601 5D

ALLIS-CHALMERS CORP., YORK, PA.
Optimizing Hydraulic Turbine and Pump/Turbine Design,
W72-09710 8C

AMERICAN SOCIETY FOR TESTING AND MATERIALS, PHILADELPHIA, PA.
Measurement of Alpha Particle Radioactivity of Water.
W72-09421 5A

Standard Method of Test for Radionuclides of Radium in Water.
W72-09422 5A

Standard Method of Test for Radioactive Cesium in Water.
W72-09423 5A

ARCTIC HEALTH RESEARCH CENTER, FAIRBANKS, ALASKA.
Possible Origin of Clostridium Botulinum Contamination of Eskimo Foods in Northwestern Alaska,
W72-09417 5C

ARGONNE NATIONAL LAB., ILL. CHEMISTRY DIV.
Variations of Sulfur Isotope Ratios in Samples of Water and Air near Chicago,
W72-09336 5B

ARIZONA UNIV., TUCSON. DEPT. OF CHEMISTRY.
Coated Wire Ion Selective Electrodes,
W72-09324 2K

Role of Solvent Extraction Parameters in Liquid Membrane Ion Selective Electrodes,
W72-09325 2K

ARIZONA UNIV., TUCSON. GEOPHYSICS LAB.
Ground-Water Volumes from Anomalous Mass Determinations for Alluvial Basins,
W72-09619 2F

ARKANSAS SOIL AND WATER CONSERVATION COMMISSION, LITTLE ROCK.
Water and Land Resources, Ouachita River Basin in Arkansas,
W72-09309 6D

ARMY ENGINEER DISTRICT, CHICAGO, ILL.
Farmers Levee and Drainage District (Draft Environmental Impact Statement).
W72-09477 4A

ARMY ENGINEER DISTRICT, HUNTINGTON, W. VA.
Willard, Kentucky. Partial Flood Protection Plan, Dry Fork of Little Fork of Little Sandy River (Final Environmental Impact Statement).
W72-09464 8D

ARMY ENGINEER DISTRICT, KANSAS CITY, MO.
Levee Unit No. L-246, Missouri River Levee System (Draft Environmental Impact Statement).
W72-09481 8D

ARMY ENGINEER DISTRICT, MEMPHIS, TENN.
Price Branch of Little La Grue Bayou, De Witt, Arkansas--Flood Control Project (Final Environmental Impact Statement).
W72-09468 4A

ARMY ENGINEER DISTRICT, NEW YORK.
Hudson River Channel, New York--Operation and Maintenance Action (Draft Environmental Impact Statement).
W72-09483 4A

ARMY ENGINEER DISTRICT, OMAHA, NEBR.
Western Unit Flood Protection Project, Billings, Montana (Draft Environmental Impact Statement).
W72-09482 4A

ARMY ENGINEER DISTRICT, TULSA, OKLA.
Dequeen Lake, Rolling Fork River, Arkansas (Draft Environmental Impact Statement).
W72-09462 8D

ARMY ENGINEER DISTRICT, WALTHAM, MASS.
Hurricane Protection Project, Stratford, Connecticut (Draft Environmental Impact Statement).
W72-09478 8D

ARMY ENGINEER, WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
The Approximate Theories of Pneumatic Wave Generators,
W72-09541 8B

The Potential of Physical Models to Investigate Estuarine Water Quality Problems,
W72-09548 5B

Selection of Scale for Riprap Model of In-Shore Harbor, Site X. Analytical Investigation,
W72-09615 8B

Flushing Studies, Victorial Channel, Victoria, Texas: Hydraulic Model Investigation,
W72-09761 8B

Status Report on the Gastineau Channel Model Study,
W72-09762 8B

ARMY ENGINEERS DISTRICT, OMAHA, NEB.
Bear Creek Dam and Lake, Colorado (Draft Environmental Impact Statement).
W72-09474 8A

ARMY ENVIRONMENTAL HYGIENE AGENCY, EDGEWOOD ARSENAL,
Laboratory Release Rate Studies of Dursban-Polymeric Formulations, March-July 1970,
W72-09676 5B

ARMY ENVIRONMENTAL HYGIENE AGENCY, EDGEWOOD ARSENAL, MD.
Polymer Formulations of Dursban and Abate as Mosquito Larvicides, April - October, 1970,
W72-09720 5B

Effects of Polymer Formulations of Dursban and Abate on Non-Target Organism Populations, April - October, 1970,
W72-09721 5C

ATLANTIC-PACIFIC INTEROCEANIC CANAL STUDY COMMISSION, WASHINGTON, D.C.
Interoceanic Canal Studies, 1970.
W72-09430 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 1-4.
W72-09431 8A

Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 5-8.
W72-09432 8A

Interoceanic Canal Studies. Annex v. Study of Engineering Feasibility. Appendixes 9-11.
W72-09433 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 12-14.
W72-09434 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendixes 15-16,
W72-09435 8A

Interoceanic Canal Studies. Annex V. Study of Engineering Feasibility. Appendix 17. A Bibliography.
W72-09436 8A

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL (ENGLAND).
Radioactive Fallout in Air and Rain (Results to Middle to 1971),
W72-09425 5A

Rapid Evaluation of Radioactive Samples by Gamma-Ray Spectrometry,
W72-09446 5A

AUBURN UNIV., ALA.
The Effects of Cobalt-60 Radiation on Textile Processing Waste,
W72-09391 5D

Crystal Seed Conditioning of Calcium Carbonate Sludge,
W72-09392 5F

AUSTRALIAN ATOMIC ENERGY COMMISSION, COOGEE.
Decontamination of Radioactive Aqueous Effluent by the Calcium-Ferric Phosphate Process,
W72-09692 5F

AUSTRALIAN NATIONAL UNIV., CANBERRA. RESEARCH SCHOOL OF BIOLOGICAL SCIENCES.
Pattern in Desert Perennials,
W72-09333 2I

AUSTRALIAN WINE RESEARCH INST., GLEN OSMOND.
Kerosene-Like Tainting in Australian Mullet,
W72-09678 5C

AVCO CORP., CINCINNATI, OHIO. (ASSIGNEE).
Process for Cleaning up Oil Spills,
W72-09490 5G

AZERBAIDZHANSKII POLITEKHNICHESKII INSTITUT, BAKU (USSR).
Groundwater and Drainage-Water Mineralization in the Mugan-sal'yany Region (Mineralizatsiya gruntovykh i drenazhnykh vod Mugano-Sal'yanskogo massiva),
W72-09750 4B

BABTIE, SHAW AND MORTON, GLASGOW, (SCOTLAND).
The Ozonization of Turret and Other Scottish Waters,
W72-09690 5F

BACTI PRODUCTS, INC. (ASSIGNEE).
Biochemical Process,
W72-09502 5D

BAILEY (RUSSELL D.) AND ASSOCIATES, UTICA, N.Y.
The Master Plan, Town of Poestenkill, N.Y., Volume 2.
W72-09300 6D

BALFOUR (D.) AND SONS, LONDON (ENGLAND).
The Effects of Oil on Sewers and Treatment Plants,
W72-09395 5D

BATELLE MEMORIAL INST., RICHLAND, WASH. PACIFIC NORTHWEST LABS.
Present Status of the U.S. Program on the Solidification of High Level Wastes,
W72-09584 5D

BATTELLE COLUMBUS LABS., OHIO.
Urban Public Policy and Political Institutions for Water-Quality Management on Lake Erie: Year One,
W72-09787 5G

BATTELLE MEMORIAL INST., COLUMBUS, OHIO. COLUMBUS LABS.
Environmental Evaluation System for Water Resource Planning,
W72-09560 6G

BATTELLE MEMORIAL INST., RICHLAND, WASH. PACIFIC NORTHWEST LAB.
Methods for Evaluating Effects of Transient Conditions in Heavily Loaded and Extensively Regulated Streams,
W72-09731 5B

BATTELLE MEMORIAL INST., RICHLAND, WASH. PACIFIC NORTHWEST LABS.
Recreational Use of the Columbia River: Evaluation of Environmental Exposure,
W72-09426 6B

Remote Sensing Acquisition of Tracer Dye and Infrared Imagery Information and Interpretation for Industrial Discharge Management,
W72-09550 5B

BATTELLE-NORTHWEST, RICHLAND, WASH.
Wastewater Ammonia Removal by Ion Exchange.
W72-09383 5D

BECHTEL CORP., SAN FRANCISCO, CALIF. SLURRY PIPELINE DEVELOPMENT.
Initiation of Ripples by Artificial Disturbances,
W72-09260 2J

BECKMAN INSTRUMENTS, INC., FULLERTON, CALIF.
Performance and Application of a New Reference Electrode for Process Potentiometric Measurements,
W72-09242 5A

BECKMAN INSTRUMENTS, INC., FULLERTON, CALIF. ADVANCED TECHNOLOGY OPERATIONS.
Iodine Colorimeter.
W72-09322 5A

BEDFORD INST., DARTMOUTH (NOVA SCOTIA). ATLANTIC OCEANOGRAPHIC LAB.
Determination of Nanomolar Quantities of Free Amino Acids Dissolved in North Atlantic Ocean Waters,
W72-09343 5A

BEDFORD INST., DARTMOUTH (NOVA SCOTIA). MARINE GEOLOGY.
Distributional Trends in the Recent Marine Sediments of Northern Baffin Bay,
W72-09763 2L

BELORUSSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT MELIORATSII I VODNOGO KHOZYAISTVA, MINST (USSR).
Problems in the Utilization of Water Resources (Problemy ispol'zovaniya vodnykh resursov).
W72-09644 8B

BIOLOGISCHE ANSTALT HELGOLAND (WEST GERMANY).
Influence of 2,4-Dinitrophenol on Respiration and Concentration of Some Metabolites in Embryos of the Herring Clupea harengus, (Einfluss Von 2,4 Dinitrophenol Auf Die Atmung Und Die Konzentration Einiger Metabolite Bei Embryonen Des Herings Clupea harengus),
W72-09356 5C

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CHEMISTRY.
The Determination of Traces of Nickel by Gas-Liquid Chromatography,
W72-09369 5A

BONNEVILLE POWER ADMINISTRATION, PORTLAND, OREG.
Stream Temperature Prediction Under Reduced Flow,
W72-09259 4A

BORDEAUX UNIV., TALENCE (FRANCE). CENTRE D'HYDROGEOLOGIE.
Geochemical Study of the Ground Water of the 'Sables Inferieurs' Confined Aquifer, of the Aquitaine Basin (Etude Geochimique de la Nappe des 'Sables Inferieurs' du Bassin d'Aquitaine),
W72-09269 2F

BRIGHAM YOUNG UNIV., PROVO, UTAH. DEPT. OF MICROBIOLOGY.
Chalcocite Oxidation and Coupled Carbon Dioxide Fixation by Thiobacillus Ferrooxidans,
W72-09359 5C

BRILEY, WILD AND ASSOCIATES, DAYTONA BEACH, FLA.
Factors Affecting Nitrification Kinetics,
W72-09174 5D

BRITISH PETROLEUM CO. LTD., LONDON (ENGLAND). (ASSIGNEE).
Boom for Oil Spilt on Water,
W72-09495 5G

BROOKHAVEN NATIONAL LAB., UPTON, N.Y.
The Benthic Macrofauna of Moriches Bay, New York,
W72-09181 5C

BUNDESGESUNDHEITSAMT, BERLIN (WEST GERMANY). INSTITUT FUER WASSER-, BODEN-, UND LUFTHYGIENE.
Rapid Determination of Gamma-Ray Emitting Radionuclides in Water (Schnelle Bestimmung Gammastrahlender Radionuklide in Wassern),
W72-09445 5A

BUREAU OF COMMERCIAL FISHERIES, WASHINGTON, D.C. OFFICE OF FOREIGN FISHERIES (TRANSLATIONS).
Manual on the Biotechnology of the Propagation and Rearing of Phytophagous Fishes.
W72-09722 8I

BUREAU OF RECLAMATION, BOISE, IDAHO. REGION 1.
Manson Unit, Chelan Division, Chief Joseph Dam Project, Washington (Final Environmental Impact Statement).
W72-09473 8C

BUREAU OF RECLAMATION, DENVER, COLO.
Portable Surge Counters Check Phase-to-Phase Surge Levels Between 115-KV Power Transformer Bushings at Blue Mesa Powerplant--Colorado River Storage Project,
W72-09187 8C

Grouting Preplaced Aggregate to Form Concrete,
W72-09190 8F

Chemical Stabilization of Soils,
W72-09191 8D

Field Tests of the 345 KV Series Compensated Glen Canyon-Pinnacle Peak Transmission Lines--Colorado River Storage Project,
W72-09192 8C

Selective Withdrawal Studies for the Fish Hatchery Outlets at Pueblo Dam--Mathematical and Physical Models,
W72-09194 8B

Comparison of Computed and Measured Dynamic Response of Monticello Dam,
W72-09198 8A

Region 7 Launches Program to reduce Subsurface Drain Costs,
W72-09697 4A

Drainage from Level and Sloping Land,
W72-09698 8B

New Techniques for Quality Control of Concrete,
W72-09712 8F

BUREAU OF RECLAMATION, WASHINGTON, D.C.
The Westwide Water Study,
W72-09701 6B

BUREAU OF SPORT FISHERIES AND WILDLIFE, COLUMBIA, MO.
Effects of Malathion on Two Warm-Water Fishes and Aquatic Invertebrates in Ponds,
W72-09567 5C

BUREAU OF SPORT FISHERIES AND WILDLIFE, COLUMBIA, MO. FISH PESTICIDE RESEARCH LAB.
Column Extraction of Pesticides from Fish, Fish Food and Mud,
W72-09315 5A

BYBROOK SEWAGE WORKS, ASHFORD (ENGLAND).
Operation of Bybrook Sewage Works, Ashford, Kent, 1965-68,
W72-09401 5D

CALGARY UNIV. (ALBERTA). DEPT. OF BIOLOGY.
A Preliminary Investigation of Bottom Fauna and Invertebrate Drift in an Unregulated and a Regulated Stream in Alberta,
W72-09362 5C

CALIFORNIA UNIV., BERKELEY. HUMAN FACTORS IN TECHNOLOGY RESEARCH GROUP.
Optimal Search for Pollution Sources,
W72-09232 5B

CALIFORNIA UNIV., BERKELEY. SANITARY ENGINEERING RESEARCH LAB.
Toxicity Assessment of Treated Municipal Wastewaters,
W72-09582 5D

CALIFORNIA UNIV., DAVIS. DEPT. OF ENVIRONMENTAL TOXICOLOGY.
Hydrolysis and Solvent Partition of Phosdrin and Related Organophosphates,
W72-09321 5B

CALIFORNIA UNIV., DAVIS. DIV. OF ENVIRONMENTAL STUDIES.
The Role of Minor Nutrients in Limiting the Productivity of Aquatic Ecosystems,
W72-09158 5C

CALIFORNIA UNIV., LIVERMORE. LAWRENCE RADIATION LAB.
Sampling and Analytical Systems for Measuring Environmental Radioactivity,
W72-09453 5A

Dose to Man Via Food-Chain Transfer Resulting From Exposure to Tritiated Water Vapor,
W72-09531 5C

CALIFORNIA UNIV., SAN DIEGO.
The Distribution of Cesium, Rubidium, and Potassium in the Quasi-Marine Ecosystem of the Salton Sea,
W72-09574 5B

CALIFORNIA UNIV., SAN DIEGO, LA JOLLA. DEPT. OF ECONOMICS.
Pollution Prices in a General Equilibrium Model,
W72-09235 5G

CALIFORNIA UNIV., SANTA BARBARA, DEPT. OF BIOLOGICAL SCIENCES.
The Santa Barbara Oil Spill Part 1: Initial Quantities and Distribution of Pollutant Crude Oil,
W72-09682 5B

The Santa Barbara Oil Spill Part 2: Initial Effects on Intertidal and Kelp Bed Organisms,
W72-09683 5C

CAMPBELL FOODS, INC., NAPOLEON, OHIO.
Handling Waste Disposal at a Major Food Plant,
W72-09591 5D

CANTERBURY UNIV., CHRISTCHURCH (NEW ZEALAND).
Seismic Resistance of Prestressed Concrete Beam-Column Assemblies,
W72-09713 8F

CARLETON UNIV., OTTAWA (ONTARIO). DEPT. OF CHEMISTRY.
Sunlight Photochemistry of Ferric Nitrilotriacetate Complexes,
W72-09379 5A

CENTRAL RICE RESEARCH STATION, SHORANUR (INDIA).
Response of Rice to Phosphate Manuring in a Waterlogged Lateritic Sandy Loam of Kerala,
W72-09578 3F

Effect of Elevation and Rainfall on the Physicochemical Properties of the Soils of the High Ranges of Kerala,
W72-09774 2G

CENTRE D'OCEANOGRAPHIE, MARSEILLE (FRANCE). STATION MARINE D'ENDOUME.
Distribution of Certain Heterotrophic Aerobic Bacteria in Eastern Mediterranean Deep-Sea Sediments, (Distribution De Certaines Bacteries Heterotrophes Aerobied Dans Les Sediments Profonds De Mediterranee Orientale),
W72-09349 5C

CESKOSLOVENSKA AKADEMIE VED, PRAGUE. USTAV JADERNEHO VYZKUMU.
Self-Diffusion of Trace Concentrations of Ce-144, Pm-147, and Eu-155 in Water Solutions,
W72-09530 5B

CHAM/HILL, CORVALLIS, OREG.
Capital and Operating Costs--AWT,
W72-09140 5D

CHICAGO DEPT. OF WATER AND SEWERS, ILL.
Use of Acid-Treated Sodium Silicate in Coagulation,
W72-09691 5F

CHRYSLER CORP., DETROIT, MICH.
The Treatment of Industrial Wastewater for Reuse--Chrysler Indianapolis Foundry,
W72-09600 5D

CIBA PHARMACEUTICAL PRODUCTS, INC., SUMMIT, N.J. RESEARCH DEPT.
Effect of a Hostile Environment on Pseudomonas aeruginosa,
W72-09244 5C

CINCINNATI UNIV., OHIO. DEPT. OF BIOLOGICAL SCIENCES.
Studies on Actinomycetes and Their Odors,
W72-09696 5F

CIVIL ENGINEERING RESEARCH INST., SAPPORO (JAPAN).
A Study on the Formation of the River Ice in a Snow Area,
W72-09637 2C

CLARKSON COLL. OF TECHNOLOGY, POTSDAM, N. Y.
Desalination by High Pressure Solidification of Water to Ice VI,
W72-09516 3A

CLYDE RIVER PURIFICATION BOARD, EAST KILBRIDE (SCOTLAND).
The Relative Importance of Freshwater Input, Temperature and Tidal Range in Determining Levels of Dissolved Oxygen in a Polluted Estuary,
W72-09345 5B

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
The Morphlogy and Physical Properties of Pressure Ridges: Barrow, Alaska, April 1969,
W72-09639 2C

COLORADO COOPERATIVE FISHERY UNIT, FORT COLLINS.
Trouts of the Upper Kern River Basin, California, with Reference to Systematics and Evolution of Western North American Salmo,
W72-09515 2E

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF ZOOLOGY.
Polluted Water: A Challenge to Forensic Biology,
W72-09498 5G

COLORADO UNIV., BOULDER. DEPT. OF CHEMICAL ENGINEERING.
Effect of Porous Structure on Carbon Activation.
W72-09581 5D

COLORADO UNIV., BOULDER. DEPT. OF CIVIL ENGINEERING.
Vacuum Filtration - Media and Conditioning Effects,
W72-09588 5D

COMMONWEALTH ASSOCIATES INC., JACKSON, MICH.
Condenser Selection for Various Cooling Water Systems,
W72-09739 5D

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF LAND RESEARCH.
An Analysis of Four Tropical Rain Forest Sites in New Guinea,
W72-09576 2I

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF PLANT INDUSTRY.
Effect of Osmotic and Matric Potentials on the Availability of Water for Seed Germination,
W72-09773 2I

CONGRESS, WASHINGTON, D.C.; AND COMMITTEE ON PUBLIC WORKS (U. S. SENATE).
The Effect of Channelization on the Environment.
W72-09459 5G

CONNECTICUT UNIV., STORRS. DEPT. OF BIOLOGY.
A Direct Method of Measuring Benthic Primary Production in Streams,
W72-09405 5A

CONSIGLIO NAZIONALE DELLE RICERCHE, ROME (ITALY). LABORATORIO DI CROMATOGRAFIA.
A Comparison of Some Ready-For-Use Thin Layers for the Separation of Heavy Metals with Butanol-3 N HCl,
W72-09353 5A

CONSORTIUM OF UNIVERSITIES, WASHINGTON, D. C. URBAN TRANSPORTATION CENTER.
Economic Information for Environmental Quality Management,
W72-09147 6G

CONTINENTAL OIL CO., PONCA CITY, OKLA.
The Analysis of Nitrogen Containing Polymeric Ashless Oil Dispersants by Dialysis and Alumina Chromatography,
W72-09376 5A

COPELAND SYSTEMS, INC., OAK BROOK, ILL.
The Clarification of Paper Mill Effluents by Activated Carbon Produced from Waste Sulfite Liquor and Other Refuse,
W72-09589 5D

CORNELL AERONAUTICAL LAB., INC., BUFFALO, N.Y.
Research on the Physical Aspects of Thermal Pollution.
W72-09728 5B

CORNELL UNIV., ITHACA, N. Y. DEPT. OF ENTOMOLOGY.
Residues of DDT in Lake Trout as a Function of Age,
W72-09714 5C

CORNELL UNIV., ITHACA, N. Y. DIV. OF BIOLOGICAL SCIENCES.
Eutrophication and Aquatic Ecosystems,
W72-09156 5C

CORPS OF ENGINEERS, WALTHAM, MASS. NEW ENGLAND DIV.
Lagoon Pond Navigation Project, Martha's Vineyard, Massachusetts (Final Environmental Impact Statement).
W72-09463 4A

CROWLEY'S MILK CO., BINGHAMTON, N.Y.
Membrane Processing of Cottage Cheese Whey for Pollution Abatement.
W72-09385 5D

CULLIGAN INTERNATIONAL CO., NORTHBROOK, ILL.
Wastewater Demineralization by Ion Exchange,
W72-09384 5D

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF BIOLOGY.
Biogeochemistry of Lakes: Major Substances,
W72-09157 5C

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). DEPT. OF CHEMISTRY.
A Critical study of Some Parameters in Quantitative in situ Investigations of Thin-Layer Chromatography by Light Absorption Methods,
W72-09411 5A

DARTMOUTH COLL. HANOVER, N.H. DEPT. OF BIOLOGICAL SCIENCES.
Phytoplankton Photosynthesis, Micronutrient Interactions, and Inorganic Carbon Availability in a Soft-Water Vermont Lake,
W72-09160 5C

DATA GRAPHIC, INC., PITTSBURGH, PA.
Magnetic Flocculation of Steel Mill Waste Waters,
W72-09585 5D

DEBRECEN UNIV. OF MEDICINE (HUNGARY). DEPT. OF PHARMACOLOGY.
Mechanism of the Growth Inhibitory Effect of Cysteine on Escherichia Coli,
W72-09407 5C

DELAWARE UNIV., NEWARK. DEPT. OF GEOLOGY.
A Guide to the Geology of Delaware's Coastal Environments,
W72-09614 2J

DELHI UNIV. (INDIA). DEPT. OF BOTANY.
Water Pollution in Delhi Lakes,
W72-09175 5C

DENVER UNIV., COLORADO. DEPT. OF GEOGRAPHY AND GEOLOGY.
Permafrost Erosion Along the Beaufort Sea Coast,
W72-09546 2J

DEPARTMENT OF AGRICULTURE, OTTAWA (ONTARIO). ENTOMOLOGY RESEARCH INST.
Physical and Biotic Factors Affecting Euxoa Species Abundance in Western North America: A Regression Analysis,
W72-09414 2I

DEPARTMENT OF AGRICULTURE, SASKATOON (SASKATCHEWAN). RESEARCH STATION.
The Temporary Abatement of Nuisance Species of Trichoptera with DDD (TDE) Larvicide,
W72-09412 5C

DEPARTMENT OF ENERGY, MINES AND RESOURCES, OTTAWA (ONTARIO). MARINE SCIENCES BRANCH.
On the Water of the Canadian Arctic Archipelago, an Atlas Presentation of 1961 and 1962 Data,
W72-09227 7C

DEPARTMENT OF EXTERNAL AFFAIRS, OTTAWA (ONTARIO).
Rights and Responsibilities of Arctic Coastal States: The Canadian View,
W72-09465 6E

DEPARTMENT OF NATURAL HEALTH AND WELFARE, OTTAWA (ONTARIO). FOOD AND DRUG RESEARCH LAB.
Zinc Retention in Young Rats Fed Increasing Levels of High-Zinc Oysters,
W72-09716 5C

DEPARTMENT OF STATE, WASHINGTON, D.C.
U.S. Opposes Unilateral Extension by Canada of High Seas Jurisdiction.
W72-09472 6E

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER QUALITY DIV.
Some Separation Characteristics of an OV-101/OV-210 Column for Organochlorinated Pesticides with Particular Reference to the Separation of Photoendrin and Endrin,
W72-09561 5A

DEPARTMENT OF THE INTERIOR, WASHINGTON, D.C.; AND SECRETARY OF THE INTERIOR, WASHINGTON, D.C. (ASSIGNEE).
Variable Orifice for Multistage Flash Evaporation or Distillation Units,
W72-09487 3A

DEPAUW UNIV., GREENCASTLE, IND. DEPT. OF ZOOLOGY.
The Effect of Temperature on the Feeding Rate and Behavior of the Caddisfly Hydropsyche frisoni,
W72-09686 5C

Aquatic Life Survey of the Wabash River--With Special Reference to the Effects of Thermal Effluents on Populations of Macroinvertebrates and Fish, 1967-1969,
W72-09725 5C

DIVISION OF WASTE MANAGEMENT AND TRANSPORTATION (AEC), WASHINGTON, D.C.
Plan for the Management of AEC-Generated Radioactive Wastes,
W72-09424 5G

DNEPROPETROVSKII GOSUDARSTVENNYI UNIVERSITET (USSR). INSTITUT GIDROBIOLOGII.
Effects of DDT and Hexachlorocyclohexane on Aquatic Animals (K voprosu o vliyanii DDT i geksakhlorana na vodnyye organizmy),
W72-09652 5C

DOW CHEMICAL CO., WALNUT CREEK, CALIF. WESTERN DIV. RESEARCH LABS.
Development of Cellulose Triacetate Hollow Fiber Reverse Osmosis Modules for Brackish Water Desalination,
W72-09517 3A

DRESSER INDUSTRIES, INC., HOUSTON, TEX. (ASSIGNEE).
Oil Slick Elimination,
W72-09501 5G

DREXEL UNIV., PHILADELPHIA, PA. DEPT. OF CHEMISTRY.
Thin Layer Chromatography and Infra-Red and Ultra-Violet Spectra of Fenthion and Seven of its Degradation Products,
W72-09182 5A

DU PONT DE NEMOURS (E. I.) AND CO., WILMINGTON, DEL. CENTRAL RESEARCH DEPT.
Rapid Photochemical Determination of Uranium (VI) At Trace Levels,
W72-09254 5A

EAST TEXAS STATE UNIV., COMMERCE. DEPT. OF EARTH SCIENCES.
Mapping Buried Bedrock Topography With Gravity,
W72-09618 2F

EASTERN KENTUCKY UNIV., RICHMOND. DEPT. OF BIOLOGY.
Stream Capture in Kentucky Indicated by Distributional Records of Fundulus catenatus and etheostoma spectabile,
W72-09252 4A

EASTERN REGIONAL RESEARCH LAB., PHILADELPHIA, PA.
The Biodegradation of Some Sulfated Alkanolamides,
W72-09344 5B

EASTMAN KODAK CO., ROCHESTER, N.Y.
All Count Distributions are not Alike,
W72-09339 7B

EDGEWOOD ARSENAL, MD.
Invertebrates Collected on and around Carroll Island, Maryland,
W72-09173 5C

ENVIRO CONTROL, INC., WASHINGTON, D.C.
Systems Analysis for Water Quality Management - Survey and Abstracts.
W72-09229 5G

ENVIROGENICS CO., EL MONTE, CALIF.; AND AEROJET-GENERAL CORP., EL MONTE, CALIF.
Evaluation of Single and Multiple Pass Seawater Desalination.
W72-09518 3A

ENVIRONMENTAL PROTECTION AGENCY, ANNAPOLIS, MD. CHESAPEAKE TECHNICAL SUPPORT LAB.
Nutrient Management in the Potomac Estuary,
W72-09171 5C

ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO. OFFICE OF WATER PROGRAMS.
Radioactivity Levels in Selected Ohio Streams; the Great Miami River, the Little Miami River, and Mill Creek; June-Aug. 1968.
W72-09533 5B

ENVIRONMENTAL PROTECTION AGENCY, CORVALLIS, OREG.
Algal Responses to Nutrient Additions in Natural Waters. I. Laboratory Assays,
W72-09164 5C

ENVIRONMENTAL PROTECTION AGENCY, LAS VEGAS, NEV. WESTERN ENVIRONMENTAL RESEARCH LAB.
Monitoring of Tritium Under Emergency Conditions,
W72-09443 5A

Environmental Monitoring System for Nuclear Tests,
W72-09452 5A

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. (ASSIGNEE).
Treatment of Sewage Digester Supernatant Liquor,
W72-09488 5D

ENVIROTECH CORP., PALO ALTO, CALIF. (ASSIGNEE).
Waste Water Treatment Process,
W72-09492 5D

System for Measuring Organic Content of Water,
W72-09493 5D

ERINDALE COLL. (ONTARIO).
Beach Water Table and Beach-Profile Measuring Equipment,
W72-09758 7B

ESSO RESEARCH AND ENGINEERING CO., LINDEN, N.J. (ASSIGNEE).
Removal of Inorganic Species by Liquid Membrane,
W72-09497 5D

ESSO RESEARCH CENTRE, ABINGDON (ENGLAND).
The Determination of Oil-Soluble Sulphonates by Two-Phase Titration,
W72-09375 5A

Displacement Chromatography of Hydrocarbons,
W72-09563 5A

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, ATHENS, GA. SOUTHEAST WATER LAB.
The Interrelation of Carbon and Phosphorus in Regulating Heterotrophic and Autotrophic Populations in an Aquatic Ecosystem, Shriner's Pond,
W72-09159 5C

FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA). FRESHWATER INST.
Emergence of Caddisflies (Trichoptera) and Mayflies (Ephemeroptera) from Heming Lake, Manitoba,
W72-09570 5C

Determination of Nitrilotriacetic acid in Inland Waters by Gas Chromatography of the Trimethyl Ester,
W72-09711 5A

FLINT WATER UTILITY, MICH.
Measurement and Control of Particulate Matter in Filter Effluents,
W72-09693 5F

FLORIDA DEPT. OF NATURAL RESOURCES, TALLAHASSEE. BUREAU OF MARINE SCIENCE AND TECHNOLOGY,
Prediction of the Florida Red Tide by Means of the Iron Index; Red Tide, Iron and Humic Acid Levels in Streams.
W72-09524 5B

FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF BIOLOGICAL SCIENCE.
Ecology and Life History of the Diamond Killifish: Adinia xenica (Jordan and Gilbert),
W72-09360 2L

FLORIDA UNIV., GAINESVILLE. COLL. OF LAW.
A Statutory Analysis of Florida's Water Pollution Control Legislation,
W72-09479 6E

FLORIDA UNIV., GAINESVILLE. DEPT. OF CHEMISTRY.
Stoichiometry of the Coagulation of Color-Causing Organic Compounds with Ferric Sulfate,
W72-09695 5F

FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING.
Nitrogen Fixation by Bacteria in Lake Mize, Florida, and in Some Lacustrine Sediments,
W72-09579 5C

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY). INLAND FISHERY RESOURCES BRANCH.
Potential Uses of Waste Waters and Heated Effluents,
W72-09733 5B

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY). TERMINOLOGY AND REFERENCE SECTION.
Selected Terms Used in Fish Culture,
W72-09261 7A

List of Organizations, Meetings, Programmes, Etc., Related to Fisheries,
W72-09262 7A

FOOD AND DRUG ADMINISTRATION, ROCKVILLE, MD. DIV. OF FOOD CHEMISTRY AND TECHNOLOGY.
Micro Scale Alkali Treatment for use in Pesticide Residue Confirmation and Sample Cleanup,
W72-09314 5A

FOOD AND DRUG ADMINISTRATION, WASHINGTON, D.C.
Heavy Metals in United States Fish,
W72-09719 5B

FOOD AND DRUG ADMINISTRATION, WASHINGTON, D.C. DIV. OF PESTICIDE CHEMISTRY AND TOXICOLOGY.
A Method for the Analysis of Fish, Animal, and Pultry Tissue for Chlorinated Pesticide Residues,
W72-09684 5A

FORAS TALUNTAIS, WEXFORD (IRELAND).
The Structure of the Species Populations in the Initial Stages of Salt-Marsh Succession,
W72-09288 4A

FOREST SERVICE (USDA) , ASHEVILLE, N.C. SOUTHEASTERN FOREST EXPERIMENT STATION.
Annotated Bibliography of Publications on Watershed Management by the Southeastern Forest Experiment Station, 1928-1970,
W72-09603 3B

FOREST SERVICE (USDA), BOISE, IDAHO. INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Salt Spray and Mineral Cycling in Two California Coastal Ecosystems,
W72-09605 2K

FOREST SERVICE (USDA), FORT COLLINS, COLO. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Seasonal and Diurnal Changes in Moisture Contents and Water Deficits of Engelmann Spruce Needles,
W72-09606 2I

The Relation of Snow Transparency to Density and Air Permeability in a Natural Snow Cover,
W72-09607 2C

Topographic Effects Apparent in Nocturnal Temperature Profiles in a Conifer Canopy,
W72-09608 2D

Vertical Profiles of Windspeed in a Pine Stand,
W72-09609 2I

An Inexpensive Heated Thermistor Anemometer,
W72-09610 2D

The Relationship Between Density and Tensile Strength in Snow,
W72-09611 2C

Take the Plunge,
W72-09612 2C

Rime Contributes to Water Balance in High-Elevation Aspen Forests,
W72-09613 2C

FOREST SERVICE (USDA), TEMPE, ARIZ. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Chaparral Treatment Effects on Streamflow,
W72-09604 3B

FOREST SERVICE (USDA), WASHINGTON, D.C.
Gypsy Moth Suppression Project (Final Environmental Impact Statement).
W72-09466 5G

FOUNDATION OF CANADA ENGINEERING CORP. LTD., TORONTO (ONTARIO).
River and Lake Ice Terminology,
W72-09625 2C

FRESNO STATE COLL. FOUNDATION, CALIF. ATMOSPHERIC WATER RESOURCES RESEARCH.
Status of Weather Modification in Watershed Management,
W72-09189 3B

FRIENDSWOOD DEVELOPMENT CO., HOUSTON, TEX.
Operation of a Central Waste Treatment System-Bayport Industrial Complex,
W72-09586 5D

GAINSVILLE DEPT. OF PUBLIC UTILITIES, FLA.
Magnesium Carbonate, A Recycled Coagulant for Water Treatment.
W72-09387 5F

GENERAL MOTORS CORP., ELYRIA, OHIO. FISHER BODY DIV.
Plating and Industrial Waste Treatment at the Expanded Plant of Fisher Body, Elyria, Ohio,
W72-09594 5D

GEOLOGICAL SURVEY, AUSTIN, TEX.
A Comparison of Mass-Transfer and Climatic-Index Evaporation Computations from Small Reservoirs in Texas,
W72-09555 2H

GEOLOGICAL SURVEY, DENVER, COLO.
Determination of Aluminum in Water,
W72-09330 5A

Deuterium Content of Snow as an Index to Winter Climate in the Sierra Nevada Area,
W72-09622 2C

GEOLOGICAL SURVEY, HONOLULU, HAWAII.
Reconnaissance Study of Sediment Transported by Streams, Island of Oahu,
W72-09759 2J

GEOLOGICAL SURVEY, LAKEWOOD, COLO.
Ground-Water Levels in the Lower Arkansas River Valley of Colorado, 1968-72.
W72-09559 4B

GEOLOGICAL SURVEY, LINCOLN, NEBR.
Characteristics of Streamflow at Gaging Stations in Shell Creek, Elkhorn River, and Salt Creek Basins, Nebraska,
W72-09556 2E

Water supplies and the Land--The Elkhorn River Basin of Nebraska,
W72-09557 7C

Use of Groundwater for Irrigation in Clay County, Nebraska, 1970,
W72-09756 4B

GEOLOGICAL SURVEY, LOGAN, UTAH.
Ground-Water Resources of Cache Valley, Utah and Idaho,
W72-09558 4B

GEOLOGICAL SURVEY, LOUISVILLE, KY. WATER RESOURCES DIV.
Float Implosion in Observation Well in Kentucky,
W72-09621 4B

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
An Inventory of Published and Unpublished Fluvial-Sediment Data for California, 1956-70,
W72-09542 2J

Water Temperatures of California Streams, South Coastal Subregion,
W72-09755 2E

GEOLOGICAL SURVEY OF ISRAEL, JERUSALEM.
Sedimentary Structures Formed by Flash Floods in Southern Israel,
W72-09540 2J

GEOLOGICAL SURVEY OF PUERTO RICO, SAN JUAN.
Electrical Analog Model Study of Water in Guayama Area, Puerto Rico: Phase 1 -- Assembling Data for the Analog Model,
W72-09543 2F

GEOLOGICAL SURVEY, PORTLAND, OREG. WATER RESOURCES DIV.
Studies of Sediment Transport in the Columbia River Estuary,
W72-09551 5B

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Availability of Ground Water for Public-Water Supply in the Pensacola Area, Florida,
W72-09267 4B

GEOLOGICAL SURVEY, TRENTON, N.J.
Occurrence and Distribution of Trace Elements in New Jersey Streams,
W72-09545 5A

GEOLOGICAL SURVEY, WASHINGTON, D.C.
Summary of Floods in the United States During 1967,
W72-09222 2E

Index of Surface-Water Records to September 30, 1970: Part 2.--South Atlantic Slope and Eastern Gulf of Mexico Basins.
W72-09224 2E

Water Resources Investigations in Louisiana, 1968.
W72-09225 7C

Water Resources Investigations in Iowa, 1968.
W72-09226 7C

Water Resources Investigations in Mississippi, 1969.
W72-09534 7C

Water Resources Investigations in Montana, 1969.
W72-09535 7C

Water Resources Investigations in Kansas, 1968.
W72-09536 7C

The Virginia Flood of 1969,
W72-09760 2E

Water Resources of Clay, Greene, Craighead, and Poinsett Counties, Arkansas,
W72-09764 7C

Analysis of the Ground-Water System by Electrical-Analog Model, Avra Valley, Pima and Pinal Counties, Arizona,
W72-09765 7C

Water Resources Investigations in Missouri, 1968.
W72-09766 7C

Water Resources Investigations in New Jersey, 1968.
W72-09767 7C

Water Resources Investigations in Minnesota, 1969.
W72-09768 7C

Ground-Water Hydraulics,
W72-09769 2F

GEOLOGICAL SURVEY. WASHINGTON, D.C. WATER RESOURCES DIV.
The Role of the U.S. Geological Survey in Waste Disposal Monitoring,
W72-09616 5B

GEORGETOWN UNIV., WASHINGTON, D.C.
Use of General Equilibrium in Regional Water Resource Planning.
W72-09228 6A

GEORGIA UNIV., ATHENS. DEPT. OF ZOOLOGY AND GEORGIA UNIV., ATHENS. COMPUTER CENTER; AND GEORGIA UNIV., SAPELO ISLAND. MARINE INST.
Nutrient Flux in Estuaries,
W72-09172 5C

GESELLSCHAFT FUER KERNFORSCHUNG M.B.H., KARLSRUHE (WEST GERMANY).
Determination of Plutonium in Environmental Surveillance Samples,
W72-09441 5A

GESELLSCHAFT FUER STRAHLEN- UND UMWELTFORSCHUNG M.B.H., NEUHERBERG BEI MUNICH (WEST GERMANY).
Rapid Methods for Radioactive Environmental Monitoring in the Federal Republic of Germany, (Schnellmethoden Zur Uberwachung Der Radioaktivitat in Der Bundesrepublik Deutschland),
W72-09456 5A

GOSUDARSTVENNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT OZERNOGO I RECHNOGO RYBNOGO KHOZYAISTVA, LENINGRAD (USSR).
Present State and Development of Scientific Research on Prevention of Fishery Pollution (Sostoyaniye i perspektivy nauchno-issledovatel'skikh rabot po probleme okhrany rybokhozyaystvennykh vodoyemov ot zagryaz-neniya),
W72-09648 5C

GREAT LAKES FORESTRY RESEARCH CENTER, SAULT SAINTE MARIE (ONTARIO).
Plant Indicators for pH and Water Level in Peatlands at Candle Lake, Saskatchewan,
W72-09730 2H

GRONINGEN RIJKSUNIVERSITEIT (NETHERLANDS). PHYSICS LAB.
Natural Isotopes in the Groundwater of the Tulum Valley, San Juan, Argentina,
W72-09276 2F

GROUNDWATER RESEARCH CENTER, JERUSALEM (ISRAEL).
Groundwater Flow in Calcareous Aquifers in the Vicinity of Barcelona, Spain,
W72-09277 2F

GUELPH UNIV. (ONTARIO).
Change of Velocity Distribution in a Cross-Section of a Freezing River and the Effect of Frazil Ice Loading on Velocity Distribution,
W72-09636 2C

GUELPH UNIV. (ONTARIO). DEPT. OF VETERINARY MICROBIOLOGY AND IMMUNOLOGY.
Infectious Pancreatic Necrosis Virus: Comparative Frequencies of Isolation From Feces and Organs of Brook Trout (Salvelinus fontinalis),
W72-09152 5A

HACH CHEMICAL CO., AMES, IOWA.
Understanding Turbidity Measurement,
W72-09671 5F

HARVARD UNIV., CAMBRIDGE, MASS. GRADUATE SCHOOL OF EDUCATION.
An Analysis of Variance for Categorical Data,
W72-09357 7C

HARVARD UNIV., CAMBRIDGE, MASS. LAB. OF APPLIED MICROBIOLOGY.
Mechanism of the Initial Events in the Sorption of Marine Bacteria to Surfaces,
W72-09568 5C

HAWAII UNIV., HONOLULU. DEPT. OF MICROBIOLOGY.
Taxonomy of Marine Bacteria: Beneckea nigrapulchrituda Sp. N.,
W72-09241 5A

HERCULES INC., WILMINGTON, DEL. (ASSIGNEE).
Flotation of Solids from Waste Waters,
W72-09496 5D

HERIOT-WATT UNIV., EDINBURGH (SCOTLAND). DEPT. OF BREWING AND BIOLOGICAL SCIENCES.
A Composite Arginine Glucose Medium for the Characterization of Pseudomonas Aeruginosa and Other Gram Negative Bacilli,
W72-09320 5C

HIGHER INST. OF RURAL ECONOMICS, SOFIA (BULGARIA).
On The Minimal Soil Tillage In Growing Maize Under Irrigation, (In Bulgarian),
W72-09753 3F

HOKKAIDO ELECTRIC CO., SAPPORO (JAPAN). DEPT. OF CIVIL ENGINEERING.
Flow Measurements of Ice-Covered Rivers in Hokkaido,
W72-09628 2C

HONEYWELL INC., FORT WASHINGTON, PA.
Water Pollution Monitoring Stations: An Ounce of Prevention,
W72-09374 5A

HUDSON PRODUCTS CORP., HOUSTON, TEX.
Power Plant Siting, Performance, and Economics with Dry Cooling Tower Systems,
W72-09741 5D

HUNTING TECHNICAL SERVICES LTS., BOREHAM WOOD (ENGLAND).
Vegetation Stripes on Sheet Wash Surfaces,
W72-09307 2I

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO, TORONTO.
Investigations into Frazil, Bottom Ice and Surface Ice Formation in the Niagara River,
W72-09632 2C

IDAHO OPERATIONS OFFICE (AEC), IDAHO FALLS. HEALTH SERVICES LAB.
Rapid Identification and Determination of Alpha Emitters in Environmental Samples,
W72-09442 5A

IDAHO UNIV., MOSCOW. COLL. OF MINES.
Migration and Leaching of Metals from Old Mine Tailings Deposits,
W72-09620 5B

IFE UNIV. (NIGERIA). DEPT. OF GEOLOGY.
Rural Water Supply in the Basement Complex of Western State, Nigeria,
W72-09275 3B

IIT RESEARCH INST., CHICAGO, ILL.
Mathematical Model for Fate of Pollutants in Near-Shore Waters,
W72-09377 5B

Preparation of Reverse-Osmosis Membranes by Surface Modification of Polymeric Films,
W72-09514 3A

ILLINOIS INST. OF TECH., CHICAGO. DEPT. OF CHEMICAL ENGINEERING.
Experimental Evaluation of Fibrous Bed Coalescers for Separating Oil-Water Emulsions.
W72-09580 5D

ILLINOIS STATE WATER SURVEY, URBANA.
Water Treatment Plant Staging Policy,
W72-09289 5F

ILLINOIS UNIV., URBANA. DEPT. OF THEORETICAL AND APPLIED MECHANICS.
Stream Turbulence Effects on Turbulent Boundary Layer,
W72-09257 2E

ILLINOIS UNIV., URBANA. DEPT. OF ZOOLOGY.
A New Species of Troglobitic Asellid From Illinois,
W72-09520 5C

ILLINOIS UNIV., URBANA. WATER RESOURCES CENTER.
Great Lakes Hydrology by Months, 1946-1965,
W72-09298 2H

IMPERIAL CHEMICAL INDUSTRIES LTD., BRIXHAM (ENGLAND).
Multi-Stage Plastic Media Treatment Plants,
W72-09598 5D

IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND).
A New Ring Shear Apparatus and its Application to the Measurement of Residual Strength,
W72-09706 8D

INDIAN INST. OF SCIENCE, BANGALORE. DEPT. OF BIOCHEMISTRY.
Phosphorus in Wastewater Effluents and Algal Growth,
W72-09176 5C

INDIANA UNIV. MEDICAL CENTER, INDIANAPOLIS. DEPT. OF CLINICAL PATHOLOGY.
Appearance of 1-Hydroxychlordene in Soil, Crops, and Fish,
W72-09317 5A

INSTITUT PASTEUR, LILLE (FRANCE). LABORATOIRE D'HYDROBIOLOGIE.
Mycobacteria of Sewage Water and Sediment, (In French),
W72-09777 5A

INSTITUT ROYAL DES SCIENCES NATURELLES DE BELGIQUE, BRUSSELS.
Radioactive and Metallic (Copper and Zinc) Pollutants in the Scheldt Estuary (in Water, Sediment and Suspended Matter), (Les Polluants Radioactifs et Metalliques (Cuivre et Zinc) dans L'Estuaire De L'Escaut (Eaux, Sediments et Matieres en Suspension)),
W72-09455 5A

INSTITUTE FOR RESEARCH, PRODUCTION AND USES OF RADIOISOTOPES, PRAGUE (CZECHOSLOVAKIA).
Gas Chromatographic Analysis of the Higher Fatty Acids of the Alga Chlorella Vulgaris (Pyrenoidosa),
W72-09365 5A

INSTITUTE OF BIOLOGY OF THE SOUTHERN SEAS, SEVASTOPOL (USSR).
Experimental Study of the Fouling Process at Sea,
W72-09564 5A

Relationship between the Productivity of Marine Mollusks and Their Life-Span,
W72-09569 5C

INSTITUTE OF MARINE RESEARCH, HLESINKI (FINLAND).
The Structure of an Ice Ridge in the Baltic,
W72-09640 2C

INSTITUTE OF PHYSICAL AND CHEMICAL RESEARCH, SAITAMA (JAPAN).
Studies on a Piscicidal Constituent of Hura crepitans: I. Isolation and Characterization of Huratoxin and its Piscicidal Activity,
W72-09779 5C

INSTITUTE OF PUBLIC HEALTH, TOKYO (JAPAN).
Cobalt Sulphides, an Effective Collector for Radio-Ruthenium Complexes in Sea-Water,
W72-09439 5A

INSTITUTO DE BIOLOGIA MARINA, MAR DEL PLATA (ARGENTINA).
Malacological Resources of the Gulf of San Matias with some Observations made in the Exploratory Campaign SAO-I-71,
W72-09708 2L

INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA (AUSTRIA).
Rapid Methods for Measuring Raidoactivity in the Environment.
W72-09437 5A

INTERNATIONAL LAB. OF MARINE RADIOACTIVITY, MONTE CARLO (MONACO).
A Simple Application of Least-Squares Fitting to Gamma Spectrometry of Marine Environmental Samples: The Case of Cesium Radionuclides,
W72-09444 5A

IOWA STATE UNIV., AMES. CENTER FOR AGRICULTURAL AND RURAL DEVELOPMENT.
Agricultural Water Demands,
W72-09526 6D

IOWA STATE UNIV., AMES. DEPT. OF AGRICULTURAL ENGINEERING.
Photographic Studies of the Dunging Behavior of Pigs in Confinement,
W72-09153 5G

IOWA UNIV., IOWA CITY. COLL. OF LAW.
Public Regulation of Water Quality in the United States,
W72-09527 5G

IOWA UNIV., IOWA CITY. INST. OF HYDRAULIC RESEARCH.
The Iowa Low Temperature Flow Facility,
W72-09627 2C

Temperature and Flow Conditions During the Formation of River Ice,
W72-09631 2C

Model Studies and Design of Thermal Outfall Structures--Quad-Cities Nuclear Plant,
W72-09740 5D

JERSEY NUCLEAR CO., RICHLAND, WASH.
On the use of Tolerance Intervals in Acceptance Sampling by Attributes,
W72-09311 7C

JOHNS HOPKINS UNIV., BALTIMORE, MD.
The Nation's Rivers,
W72-09188 5G

The Dissipation of Heat from Thermal Discharges,
W72-09732 5B

JOHNS HOPKINS UNIV., BALTIMORE, MD. CHESAPEAKE BAY INST.
A Three-Dimensional Current Meter for Estuarine Applications,
W72-09334 2L

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF GEOGRAPHY; AND JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF ENVIRONMENTAL ENGINEERING.
Heat Dissipation at Power Plant Cooling Lakes,
W72-09736 2D

JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD. MCCOLLUM-PRATT INST.
Bioluminescence and Primary Productivity in Marine Estuarine Environments,
W72-09575 5C

JOHNS-MANVILLE RESEARCH AND ENGINEERING CENTER, MANVILLE, N.J.
MBF Pilot Plant Filtration of Combined Municipal and Paper Mill Waste,
W72-09301 5D

KAO SOAP CO., WAKAYAMA (JAPAN). INDUSTRIAL RESEARCH LAB.
Nuclear Magnetic Resonance Study of Interaction between Anionic and Nonionic Surfactants in their Mixed Micelles,
W72-09410 5A

KAROLINSKA INSTITUTET, STOCKHOLM (SWEDEN). DEPT. OF CLINICAL CHEMISTRY.
Improved Continuous Radio Gas Chromatography of Hydrogen-3-- and Carbon-14--Labelled Compounds Using Hydrocracking,
W72-09352 5A

KERNFORSCHUNGSZENTRUM, KARLSRUHE (WEST GERMANY). INSTITUT FUER STRAHLENBIOLOGIE.
Rapid Determination of Some Transuranium Elements in Biological Material by Liquid Scintillation Counting,
W72-09354 5A

KIEL UNIV. (WEST GERMANY). INSTITUT FUER MEERESKUNDE.
The Water Economy of the Sea Grass Thalassia testudinum,
W72-09784 2L

KILLAIN (ELSON T.) ASSOCIATED, MILLBURN, N.J.
A Master Sewerage Plan for Burlington County, New Jersey.
W72-09303 6D

KISHINEV BOTANICAL GARDEN (USSR).
Biogeochemical Sources of Iodine and Cobalt in Moldavia (Biogeokhimicheskiye provintsii yoda i kobalta v Moldavii),
W72-09643 2K

LAVAL UNIV., QUEBEC. LAB. OF ICE MECHANICS.
Formation of Primary Ice Layers,
W72-09635 2C

LEBANESE UNIV., BEIRUT. FACULTY OF SCIENCES.
Contribution of the Study of Zooplankton in Lebanese Waters, (Contribution A L' Etude Du Zooplancton Des Eaux Libanaises),
W72-09355 5A

LENINGRAD STATE UNIV. (USSR).
Age of the Last Glacial Maximum in the Western Dvina-Dnieper Interfluve (Vozrast maksimal'noy stadii poslednego oledeneniya na mezhdurech'ye Zapadnoy Dviny i Dnepra),
W72-09255 2C

LONDON BOROUGH OF CROYDON (ENGLAND).
Design of the Beddington Works of the London Borough of Croydon,
W72-09400 5D

LONDON GRADUATE SCHOOL OF BUSINESS STUDIES (ENGLAND).
Externalities and Public Goods,
W72-09143 6A

MAGYAR TUDOMANYOS AKADEMIA KOZPONTI FIZIKAI KUTATO INTEZETE, BUDAPEST.
Kinetics of OH Radical Reactions in Irradiated Ordinary and Supercooled Water,
W72-09428 5B

MAIN GEOPHYSICAL OBSERVATORY. LENINGRAD (USSR).
Long-Term Cyclic Fluctuations of Atmospheric Precipitation in the USSR (Mnogoletniye tsiklicheskiye kolebaniya atmosfernykh osadkov na territorii SSSR),
W72-09747 2B

MAINE UNIV., ORONO. DEPT. OF CIVIL ENGINEERING.
Electrically Induced Coagulation of Lignin from Kraft Mill Wastewaters,
W72-09597 5D

MAINE UNIV., ORONO. DEPT. OF ZOOLOGY.
Notes on the Biology of Pygospio Elegans from Maine,
W72-09685 5C

MANCHESTER UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
Theoretical Analysis of Flow Past Leaf Gate,
W72-09274 8B

MARINE BIOLOGICAL LAB., WOODS HOLE, MASS. SYSTEMATICS-ECOLOGY PROGRAM.
Cape Cod Bay Ecosystem Quantitative Analysis,
W72-09573 2L

MARYLAND UNIV., COLLEGE PARK. WATER RESOURCES RESEARCH CENTER.
Effects of Thermal Pollution on Productivity and Stability of Estuarine Communities,
W72-09723 5C

MARYLAND UNIV., PRINCE FREDERICK. HALLOWING POINT FIELD STATION.
Upper Temperature Tolerances of Some Estuarine Bivalves,
W72-09734 5C

MASCHINENBAU A. G. BALCKE, BOCHUM (WEST GERMANY).
Method and Apparatus for Withdrawing Heat from Industrial Plants, Especially Power Plants,
W72-09489 5D

MASCHINENFABRIK AUGSBURG-NUERNBERG A.G., NUREMBERG (WEST GERMANY).
Air Cooling for Condensation and Exhaust Heat Rejection in Large Generating Stations,
W72-09738 5D

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Resistance of Soil to Liquefaction and Settlement,
W72-09704 8D

MASSACHUSETTS INST. OF TECH., CAMBRIDGE; AND ILLINOIS UNIV., CHICAGO.
Tensile Tests of Ferrocement,
W72-09709 8F

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF ECONOMICS.
The Economist's Approach to Pollution and Its Control,
W72-09145 6C

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. WATER RESOURCES AND HYDRODYNAMICS LAB.
An Analytical and Experimental Investigation of Surface Discharges of Heated Water,
W72-09729 5B

MASSACHUSETTS UNIV., AMHERST. WATER RESOURCES RESEARCH CENTER.
Possible Effects of Organochlorine Pesticides on Primary Productivity and Skeletogenesis of New England Estuarine and Coastal Marine Algae,
W72-09653 5C

MCGILL UNIV., MONTREAL (QUEBEC).
Optimal Distribution of Water to Irrigation Canals,
W72-09195 3F

MIAMI UNIV., FLA. INST. OF MARINE SCIENCES.
Insidious Alteration of the Estuarine Environment,
W72-09717 5C

MICHIGAN DEPT. OF NATURAL RESOURCES, LANSING. BUREAU OF WATER MANAGEMENT.
Chlorinated Municipal Waste Toxicities to Rainbow Trout and Fathead Minnows.
W72-09154 5C

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF ENTOMOLOGY.
Photochemistry of Bioactive Compounds. Solution-Phase Photochemistry of Asymmetric Triazin-5 (4H)-Ones,
W72-09250 5B

MICHIGAN STATE UNIV., HICKORY CORNERS. W. K. KELLOGG BIOLOGICAL STATION.
The Role of Carbon in Hard-Water Marl Lakes,
W72-09161 5C

Energetics of Natural Populations of Freshwater Macroconsumers,
W72-09666 5C

MICHIGAN UNIV., ANN ARBOR. DEPT. OF CIVIL ENGINEERING.
Mechanism of Hydrogen Ion Buffering in Natural Waters,
W72-09687 5F

MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.
Phosphorus, Silica, and Eutrophication of Lake Michigan,
W72-09166 5C

MICHIGAN UNIV., ANN ARBOR. SCHOOL OF PUBLIC HEALTH.
Distribution of Cesium-137 and Naturally Occurring Radionuclides in Sediments of Lake Michigan,
W72-09532 5B

MIDDLE LEE REGIONAL DRAINAGE SCHEME (ENGLAND).
The Effect of Chloroform in Sewage on the Production of Gas From Laboratory Digesters,
W72-09398 5D

MILLTRONICS LTD., PETERBOROUGH (ONTARIO).
A Practical On-Stream Particle Size Analysis System,
W72-09372 7B

MINISTERSTVO SELSKOGO KHOZYAISTVA UZBEK SSR, TASHKENT. INSTITUT POCHVOVEDENIYA.
Oxidation-Reduction Conditions in Irrigated Soils of the Tashkent Oasis (Ob osobennostyakh okislitel'no-vosstanovitel'nykh usloviy oroshayemykh pochv Tashkentskogo oazisa),
W72-09743 3F

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, BURNHAM-ON-CROUCH (ENGLAND). FISHERIES LAB.
Monitoring Metals in Marine Animals,
W72-09718 5A

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, LOWESTOFT (ENGLAND). FISHERIES RADIOBIOLOGICAL LAB.
Rapid Methods for Specific Radionuclide Analysis and their Application to Aquatic Emergency Conditions,
W72-09457 5A

MINNESOTA UNIV., MINNEAPOLIS. DEPT. OF BOTANY.
Penetration of Bog Peats and Lake Sediments by Tritium From Atmospheric Fallout,
W72-09240 5B

MINNESOTA UNIV., MINNEAPOLIS. DEPT. OF LABORATORY MEDICINE.
Nucleic Acid Enzyme Studies of Nonfermentative Gram-Negative Bacteria Using Thin-Layer Chromatography,
W72-09408 5A

MISSOURI BASIN ENGINEERING HEALTH COUNCIL, CHEYENNE, WYO.
Waste Treatment Lagoons-State of the Art.
W72-09386 5D

MISSOURI UNIV., COLUMBIA. DEPT. OF CIVIL ENGINEERING.
Carbon Limitation in Sewage Lagoons,
W72-09162 5C

MITRE CORP., MCLEAN, VA.
Monitoring the Environment of the Nation,
W72-09230 6G

MONSANTO CO., TEXAS CITY, TEX.
More Accurate Gas-Chromatographic Analysis Using Flame-Ionization Detector,
W72-09373 5A

MONSANTO ENVIRO-CHEM SYSTEMS INC., DAYTON, OHIO.
Computer Software for Wastewater Treatment Plant Design,
W72-09233 5D

MOSCOW STATE UNIV. (USSR).
Water Pollution and Problems in Water Toxicology (Zagryazneniye vod i zadachi vodnoy toksikologii),
W72-09647 5C

Determination of the Toxicity of Contaminated Freshwater with Respect to Certain Hydrobionts (Opredeleniye toksichnosti zagryaznennykh presnykh vod v otnoshenii nekotorykh gidrobiontov),
W72-09649 5C

MOSCOW STATE UNIV. (USSR). FACULTY OF BIOLOGY AND SOIL SCIENCE.
Moisture Variations in a Model Sod-Podzolic Soil (O nekotorykh zakonomernostyakh var-'irovaniya vlazhnosti v model'noy dernovo-podzolistoy pochve),
W72-09748 2G

MUNICIPALITY OF METROPOLITAN SEATTLE, WASH.; AND BROWN AND CALDWELL, INC., SAN FRANCISCO, CALIF.
How Seattle Beat Pollution,
W72-09179 5C

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C. INST. FOR MATERIALS RESEARCH.
Repeatability and Reproducibility,
W72-09310 7C

NATIONAL CANNERS ASSOCIATION, BERKELEY, CALIF. WESTERN RESEARCH LAB.
Liquid Wastes from Canning and Freezing Fruits and Vegetables.
W72-09390 5D

NATIONAL ENERGY AUTHORITY, REYKJAVIK (ICELAND).
River and Coastal Ice Problems in Iceland,
W72-09624 2C

Ice Conditions in the Thjorsa River System,
W72-09641 2C

NATIONAL INST. OF RADIOLOGICAL SCIENCES, CHIBA (JAPAN).
Role of Low-Background Beta-Ray Spectrometers for Rapid Assay of Environmental Samples,
W72-09447 5A

NATIONAL INST. OF RADIOLOGICAL SCIENCES, TOKYO (JAPAN).
Rapid and Simple Determination of 59Fe, 60Co, 65Zn, 137Cs, and 95Zr in Concentrated Salts Solutions,
W72-09440 5A

NATIONAL INSTITUTE OF RADIOLOGICAL SCIENCES, CHIBA (JAPAN).
Measurements of 89Sr and 90Sr in Environmental Samples by a Low-Background Beta-Ray Spectrometer,
W72-09450 5A

NATIONAL MARINE FISHERIES SERVICE, BEAUFORT, N.C. CENTER FOR ESTUARINE AND MENHADEN RESEARCH.
Fallout Cesium-137 in Clams (Rangia Cuneata) From the Neuse River Estuary, North Carolina,
W72-09337 5A

NATIONAL MARINE FISHERIES SERVICE, WASHINGTON, D.C.
Data on Samples for Surf Clams and Ocean Quahogs,
W72-09521 7C

NATIONAL OCEAN SURVEY, ROCKVILLE, MD.
On the Classification and Trends of Long Period Sea Level Series,
W72-09757 7C

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ROCKVILLE, MD. OFFICE OF SCIENCE AND TECHNOLOGY.
Bomex Temporary Archive Description of Available Data,
W72-09263 7C

NATIONAL PLANNING ASSOCIATION, WASHINGTON, D.C. CENTER FOR TECHNO-ECONOMIC STUDIES.
The Role of Research and Development in Water Resources Planning and Management for Achieving Urban Goals,
W72-09788 6A

NATIONAL RADIATION LAB., CHRISTCHURCH (NEW ZEALAND).
Environmental Radioactivity in New Zealand. Quarterly Report, Oct.-Dec. 1970.
W72-09429 5A

NATIONAL RADIOLOGICAL PROTECTION BOARD, HARWELL (ENGLAND).
The Nuclear Power Industry's Need for Rapid and Accurate Estimation of Radioactivity in the Environment,
W72-09438 5A

NATIONAL RESEARCH COUNCIL OF CANADA, OTTAWA (ONTARIO). DIV. OF BUILDING RESEARCH.
Break-Up and Control of River Ice,
W72-09642 2C

NATIONAL RESEARCH COUNCIL OF CANADA, OTTAWA (ONTARIO). HYDRAULICS SECTION.
Dynamics of Contained Oil Slicks,
W72-09258 5G

NATIONAL RESEARCH COUNCIL OF CANADA, SASKATOON (SASKATCHEWAN). PRAIRIE REGIONAL LAB.
Continuously Synchronised Growth,
W72-09340 5C

NATURE CONSERVANCY, ABBOTS RIPTON (ENGLAND).
The Formation and Maintenance of Water-Meadows in Hampshire, England,
W72-09707 4A

NATURE CONSERVANCY, ABBOTS RIPTON (ENGLAND). MONKS WOOD EXPERIMENTAL STATION.
Pollutants and Food-Chains,
W72-09402 5C

NAVAL ORDNANCE LAB., WHITE OAK, MD.
Analysis of Explosives in Sea Water,
W72-09312 5A

NEPTUNE MICROFLOC, INC., CORVALLIS, OREG.
Plant Scale Reactivation and Reuse of Carbon in Wastewater Reclamation,
W72-09688 5D

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF SOIL AND WATER SCIENCE.
Water Budget Analysis of a New England Wetland,
W72-09265 3B

NEW HAMPSHIRE WATER SUPPLY AND POLLUTION CONTROL COMMISSION, CONCORD.
Algae Control by Mixing, Staff Report on Kezar Lake in Sutton, N.H.
W72-09304 5G

NEW MEXICO AGRICULTURAL EXPERIMENT STATION, UNIVERSITY PARK.
Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties,
W72-09658 3F

Soil Associations and Land Classification for Irrigation, Chaves County,
W72-09659 3F

Soil Associations and Land Classification for Irrigation, Grant County,
W72-09660 3F

Soil Associations and Land Classification for Irrigation, Mora County,
W72-09661 3F

Soil Associations and Land Classification for Irrigation, De Baca County,
W72-09662 3F

Land Classification for Irrigation, Roosevelt County,
W72-09663 3F

Land Classification for Irrigation, Torrance County,
W72-09664 3F

Soil Associations and Land Classification for Irrigation, Quay County,
W72-09665 3F

NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). SCHOOL OF BOTANY.
The Mangrove Swamp and Salt Marsh Communities of the Sydney District. IV. The Significance of Species Interaction,
W72-09286 2L

NEW YORK OPERATIONS OFFICE (AEC), N. Y. HEALTH AND SAFETY DIV.
Tropospheric Scavenging of 90Sr and 3H,
W72-09528 5A

NEW YORK OPERATIONS OFFICE (AEC), N.Y. HEALTH AND SAFETY LAB.
Application of Liquid Scintillation Spectrometry for Total Beta and Alpha Assay,
W72-09449 5A

NEW YORK STATE COLL. OF AGRICULTURE, ITHACA.
A Survey of the Lead Content of Fish From 49 New York State Waters,
W72-09715 5B

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, ALBANY. ENVIRONMENTAL QUALITY RESEARCH AND DEVELOPMENT UNIT.
Chemical-Physical Wastewater Treatment Phase 2: Activated Carbon Adsorption and Polishing,
W72-09302 5D

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY. BUREAU OF WATER RESOURCES PLANNING.
Multipurpose Operation Studies of a Canal-Lake-River System--Oswego River System, New York,
W72-09287 4A

NEW YORK STATE DEPT. OF HEALTH, ALBANY. ENVIRONMENTAL HEALTH CENTER.
Characterization of Phosphorus-Limited Plankton Algae,
W72-09163 5C

NEWCASTLE AND GATESHEAD WATER CO., NEWCASTLE-UPON-TYNE (ENGLAND).
The Application to Existing Plant of Recent Developments in Water Filtration,
W72-09689 5F

NEWCASTLE-UPON-TYNE UNIV. (ENGLAND).
Development and Use of a Large-Volume Automatic Respirometer,
W72-09396 5D

NORGES TEKNISKE HOEGSKOLE, TRONDHEIM; AND ILLINOIS UNIV., CHICAGO.
Testing Methods for Concrete Durability,
W72-09702 8F

NORGES TEKNISKE HOEGSKOLE, TRONDHEIM. RIVER AND HARBOR LAB.
Heat Exchanges and Frazil Formation,
W72-09633 2C

NORTH AMERICAN ROCKWELL CORP., CANOGA PARK, CALIF. ATOMICS INTERNATIONAL DIV.
Phosphate Precipitation with Ferrous Iron,
W72-09388 5D

NORTH AMERICAN ROCKWELL CORP., CANOGA PARK, CALIF. ROCKETDYNE DIV.
Instrumentation for In-Situ Determination of Ice Particle Size Distribution,
W72-09513 3A

NORTH AMERICAN WEATHER CONSULTANTS, GOLETA, CALIF.
A Hydrometeorological Data Appraisal and Design Study in Certain River Basins in the Western United States.
W72-09272 2B

NORTH CAROLINA STATE DEPT. OF WATER AND AIR RESOURCES, RALEIGH. DIV. OF GROUND WATER.
Geology and Ground-Water Resources of Northwestern North Carolina,
W72-09264 4B

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING; AND NORTH CAROLINA WATER RESOURCES RESEARCH INST., RALEIGH.
Quality of Effluent from Swine Production Areas,
W72-09151 5B

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF CHEMISTRY.
Mass Spectrometric Isotope Ratio Measurements and Peak Area Integration using the Peak-Switching Feature of the Aei MS-902,
W72-09326 5A

NORTH CAROLINA WATER RESOURCES RESEARCH INST., RALEIGH.
Analog Modeling to Determine the Fresh Water Availability on the Outer Banks of North Carolina,
W72-09297 4B

Phosphorus and Eutrophication in the Pamlico River Estuary, N. C., 1966-1969 - A Summary,
W72-09655 5C

Contamination of Surface and Ground Water with Pesticides Applied to Cotton,
W72-09657 5B

NORTH CENTRAL FOREST EXPERIMENT STATION, GRAND RAPIDS, MINN. NORTHERN CONIFERS LAB.
Water Table Drawdown Around an Open Ditch in Organic Soils,
W72-09268 4A

NORTH DAKOTA STATE UNIV., FARGO.
Development and Trail use of Acceptance Sampling Plans for Compacted Embankments,
W72-09700 8D

NORTHERN REGIONAL RESEARCH LAB., PEORIA, ILL.
Selective Hydrogenation of Soybean Oil. VI. Copper-on-Silica Gel Catalysts,
W72-09346 5A

NORWEGIAN WATER RESOURCES AND ELECTRICITY BOARD, OSLO. DEPT. OF HYDROLOGY.
Measurements of Ice Roughness and the Effect of Ice Cover on Water Levels in Three Norwegian Rivers,
W72-09638 2C

NOVOSIBIRSK INST. OF AGROCHEMISTRY AND SOIL SCIENCE (USSR).
Water Erosion of Soils in the Ob' River Region Near Novosibirsk (Vodnaya eroziya pochv Novosibirskogo Priob'ya),
W72-09281 2J

NUKLEARNI INSTITUT JOZEF STEFAN, LJUBLJANA (YUGOSLAVIA).
The Toluene Extraction of Some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part 1. Extraction Behaviour of As, Au, Bi, Br, Cd, Cu, Ga, Ge, In, Hg, Mo, Pb, Sb, Se, Sn, W and Zn,
W72-09367 5A

The Toluene Extraction of some Elements as Iodides from Sulphuric Acid-Potassium Iodide Media. Application to Neutron Activation Analysis. Part II. Determination of Arsenic and Antimony in Biological Materials at Su bmicrogram Levels,
W72-09368 5A

OAK RIDGE NATIONAL LAB., TENN.
Mercury in the Environment - An Annotated Bibliography,
W72-09420 5B

OESTERREICHISCHE STUDIENGESELLSCHAFT FUER ATOMENERGIE G.M.B.H., SEIBERSDORF. INSTITUT FUER STRAHLENSCHUTZ.
A Quick and Convenient Measurement Method for Surface and Liquid Contamination Using the TLD System,
W72-09451 5A

OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE-MER, PARIS (FRANCE).
Hydro-Physiographic Model,
W72-09234 6A

OFFICE OF NAVAL RESEARCH, LONDON (ENGLAND).
Summer Conference of Society for Applied Bacteriology, Liverpool, 13-15 July 1971,
W72-09675 5C

OFFICE OF SCIENCE AND TECHNOLOGY, WASHINGTON, D.C.
Electric Power and the Environment.
W72-09529 6G

OFFICE OF WATER RESOURCES RESEARCH, WASHINGTON, D.C. WATER RESOURCES SCIENTIFIC INFORMATION CENTER.
Soil Nitrogen Cycle--A Bibliography.
W72-09299 2G

OHIO STATE UNIV., COLUMBUS. WATER RESOURCES CENTER.
Hydrologic Investigation of Small Watersheds in Ohio, Phase I: 1966-1969,
W72-09296 2A

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF AGRICULTURAL ENGINEERING.
Alternatives for Waste Management for Open Beef Feedlots,
W72-09150 5G

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF ZOOLOGY.
Diurnal Uptake of NO3 and NH4 by a Ceratophyllum-Periphyton Community,
W72-09406 5C

OKLAHOMA STATE UNIV., STILLWATER. SCHOOL OF CIVIL ENGINEERING.
Organic Concentration and Hydraulic Loading Versus Organic Loading in Evaluation of Trickling Filter Performance,
W72-09596 5D

OKLAHOMA UNIV., OKLAHOMA CITY. DEPT. OF ENVIRONMENTAL HEALTH.
A Modified Delves Cup Atomic Absorption Procedure for the Determination of Lead in Blood,
W72-09332 5A

OREGON STATE DEPT. OF ENVIRONMENTAL QUALITY, PORTLAND.
Water Quality Control in Oregon.
W72-09669 5G

OREGON STATE UNIV., CORVALLIS. DEPT. OF ENTOMOLOGY.
Emergence Trap Collections of Trichoptera from an Oregon Stream,
W72-09571 5A

OREGON STATE UNIV., CORVALLIS. ENGINEERING EXPERIMENT STATION.
Proceedings, 1971 Technical Conference on Estuaries of the Pacific Northwest.
W72-09547 5B

OSAKA KYOIKU UNIV. (JAPAN). BIOLOGY LAB.
Preliminary Hydrobiological Research of Some Southeast Asian Inland Waters, (In Japanese),
W72-09394 2K

OSAKA UNIV. (JAPAN). FACULTY OF SCIENCES.
Water Movement in a Plant Cell on Application of Hydrostatic Pressure,
W72-09786 2I

OTAGO UNIV., DUNEDIN (NEW ZEALAND). MEDICAL SCHOOL.
Possible DDT Mortality in Young Rainbow Trout,
W72-09141 5C

PACE COLL., NEW YORK; AND HASKINS LABS., NEW YORK; AND NEW YORK UNIV., N.Y. COURANT INST. OF MATHEMATICAL SCIENCES.
Ecological Niches of Sympatric Phytoplankton Species,
W72-09180 5C

PACIFIC NORTHWEST WATER LAB., CORVALLIS, OREG.
Applications of Some Numerical Models to Pacific Northwest Estuaries,
W72-09549 5B

Disposal of Solid Aluminum Process Wastes in the Ocean,
W72-09552 5C

Design and Construction of a Saltwater Environment Simulator,
W72-09553 5C

Salinity, Runoff and Wind Measurements, Yaquina Estuary, Oregon,
W72-09554 5C

A Method for Predicting the Performance of Natural Draft Cooling Towers.
W72-09726 5D

PACIFIC NORTHWEST WATER LAB., CORVALLIS, OREG.; AND SHAGAWA LAKE EUTROPHICATION CONTROL PROJECT, ELY, MINN.
Algal Responses to Nutrient Additions in Natural Waters. II. Field Experiments,
W72-09165 5C

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF BIOPHYSICS.
Response of Escherichia Coli B/r to High Concentrations of Sucrose in a Nutrient Medium,
W72-09364 5C

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. INST. FOR RESEARCH ON LAND AND WATER RESOURCES.
Microbiological Characterization of Activated Sludge in a Wastewater Treatment Plant Chemically Modified for Phosphorous Removal,
W72-09654 5D

PERKIN-ELMER CORP., NORWALK, CONN.
The Determination of Lead and Cadmium in Soils and Leaves by Atomic Absorption Spectroscopy,
W72-09331 5A

PISA UNIV. (ITALY). ISTITUTO DI CHIMICA ANALITICA ED ELETTROCHIMICA.
Electro-Oxidation of Iodine on Smooth Platinum in Aqueous Media,
W72-09245 5A

POLISH ACADEMY OF SCIENCES, WARSAW. DEPT. OF APPLIED LIMNOLOGY.
Elution of Mineral Components Out of Dead Reed Phragmites communis Trin,
W72-09778 2H

PORTLAND WATER BUREAU, OREG.
Rate Philosophy,
W72-09142 6C

PROCTER AND GAMBLE CO., CINCINNATI, OHIO. ENVIRONMENTAL WATER QUALITY RESEARCH DEPT.
Detergents: Nutrient Considerations and Total Assessment,
W72-09169 5C

PUBLIC HEALTH LAB., CONWAY (WALES).
Comparison of Methods of Estimating the Number of Escherichia coli in Edible Mussels and the Relationship between the Presence of Salmonellae and E. coli,
W72-09319 5A

QUEEN ELIZABETH COLL., LONDON (ENGLAND). DEPT. OF MICROBIOLOGY.
Introductory Lecture: Prospects and Problems in Continuous Flow Culture of Micro-Organisms,
W72-09341 5C

QUEEN'S UNIV., KINGSTON (ONTARIO).
Temperature Gradients in a Lake Ice Cover,
W72-09630 2C

RADFORD COLL., VA.
Chemical Treatment of Spent Vegetable Tan Liquor,
W72-09599 5D

RAMSEIER (ROY EDWIN) AND ASSOCIATES, BERKELEY, CALIF.
Testing New Sewer Pipe Installations,
W72-09595 5D

RAND CORP., SANTA MONICA, CALIF.
Some Economic Aspects of Rain Stimulation,
W72-09146 3B

RAYTHEON CO., LEXINGTON, MASS. ENVIRONMENTAL SYSTEMS CENTER.
Getting Representative Water Samples,
W72-09672 5A

READING UNIV. (ENGLAND). DEPT. OF CHEMISTRY.
Ion Association and the Analysis of Precise Conductimetric Data,
W72-09544 2K

REICHHOLD CHEMICALS, INC., WHITE PLAINS, N.Y. (ASSIGNEE).
Process for Removal of Inorganic and Organic Matter from Waste Water Systems,
W72-09500 5D

RESEARCH INST. OF VETERINARY MEDICINE, BRNO (CZECHOSLOVAKIA).
Determination of Environmental Radioactivity by Liquid-Scintillation Spectrometry,
W72-09448 5A

RESOURCES FOR THE FUTURE, INC., WASHINGTON, D.C.; AND CALIFORNIA UNIV., RIVERSIDE. DEPT. OF ECONOMICS.
Economics and the Environment, A Materials Balance Approach,
W72-09139 6A

REX CHAINBELT INC., MILWAUKEE, WIS.
A Mathematical Model of a Final Clarifier.
W72-09382 5D

REYNOLDS INTERNATIONAL, INC., RICHMOND, VA. (ASSIGNEE).
Method of and Apparatus for Skimming Flotsam from the Surface of a Body of Water,
W72-09499 5G

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Arsenate in the Western North Atlantic and Adjacent Regions,
W72-09249 5A

RHODE ISLAND UNIV., KINGSTON. WATER RESOURCES CENTER.
The Rhode Island Water Resources Research Program, Seventh Annual Report.
W72-09200 9D

RHODIA INC., NEW BRUNSWICK, N.J. DEPT. OF ANALYTICAL CHEMISTRY.
Determination of Carbetamide Residues and its Aniline Metabolite,
W72-09316 5A

RICE UNIV., HOUSTON, TEX.
Biological Factors in Aerator Performance,
W72-09602 5D

RIJKSWATERSTAAT, THE HAGUE (NETHERLANDS). DIRECTORATE FOR WATER MANAGEMENT AND HYDRAULIC RESEARCH.
Ice Cover Formation and Associated Hydro-Dynamic Effects in the Lower Part of the River Rhine,
W72-09634 2C

ROBERT A. TAFT SANITARY ENGINEERING CENTER, CINCINNATI, OHIO.
Research on Algal Odor,
W72-09694 5F

ROCHESTER UNIV., N.Y. DEPT. OF PHYSIOLOGY.
Partial Pressure of Gases Dissolved at Great Depth,
W72-09537 1B

ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCES, MIAMI, FLA.
Catches of Postlarval White Shrimp, 'Penaeus setiferus' (Linn.), and Brown Shrimp, P. aztecus ives, and Temperature and Salinity Observations in Vermilion Bay, Louisiana, March 1963 to April 1967,
W72-09674 2L

ROTTERDAMS HAVENREINIGINGEN TRANSPORT (NETHERLANDS).
Separator for Nonmiscible Liquids,
W72-09509 5G

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J.
Aeration Systems for Large Navigable Rivers,
W72-09196 5G

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF BACTERIOLOGY.
Growth of Obligate Autotrophic Bacteria on Glucose in a Continuous Flow-Through Apparatus,
W72-09318 5C

SALFORD UNIV. (ENGLAND).
Analysis of Small Quantities of Saccharides in Aqueous Effluents,
W72-09419 5A

SAN FRANCISCO ENERGY RESEARCH LAB., CALIF.
Numerical Methods for Determining Streamlines and Isopressures for Use in Fluid-Flow Studies,
W72-09754 2F

SANDERS ASSOCIATES, INC., NASHUA, N.H. (ASSIGNEE).
Apparatus for Reoxygenating a Body of Water,
W72-09503 5G

SARGENT AND LUNDY, INC., CHICAGO, ILL.; AND ALLEGHENY POWER SERVICE CORP., GREENSBURG, PA.
The Computer's Role in Design of a 500-KV Transmission Line,
W72-09699 8C

SASSARI UNIV. (ITALY). FACULTY OF MEDICAL CHIRURGY.
Geologic and Hydrologic Study of Northern Sardinia: Report Number 3. The Provision of Water for the Region of Anglona, (In Italian),
W72-09781 6D

SCIENTIFIC RESEARCH INST. OF HYDROMETEOROLOGICAL INSTRUMENTS, LENINGRAD (USSR).
Information Bulletin on Hydrometeorological Instruments and Investigation Techniques (Informatsionnyye materialy po gidrometeorologicheskim priboram i metodam nablyudeniy).
W72-09278 7B

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
Cyanide Extraction and Electrodisposition of Trace Amounts of Radioactive Silver From Large Biological Samples,
W72-09246 5A

The Statistics of Subsampling,
W72-09416 7B

SHEFFIELD POLYTECHNIC (ENGLAND). DEPT. OF CHEMISTRY.
The Spectrofluorimetric Determination of Sulphide,
W72-09253 5A

SHELL DEVELOPMENT CO., EMERYVILLE, CALIF.
Stabilization of Refinery Waste Water with the Activated Sludge Process: Determination of Design Parameters,
W72-09593 5D

SHELL OIL CO., NEW YORK. (ASSIGNEE).
Oil Spill Removal Method,
W72-09510 5G

SLOVENSKA AKADEMIE VIED, BRATISLAVA (CZECHOSLOVAKIA). GEOLOGICKE LABORATORIUM.
Determination of Antimony in Geological Materials by Atomic Absorption Spectrometry,
W72-09328 5A

SNOWY MOUNTAINS HYDRO-ELECTRIC AUTHORITY, COOMA (AUSTRALIA).
Water Quality Records of the Snowy Mountains Region, Australia.
W72-09770 7C

Catalogue of Meteorological Data of the Snowy Mountains Region, Australia.
W72-09771 7C

SOIL CONSERVATION SERVICE, LINCOLN, NEB.
Role of the Soil Conservation Service in Design of Feedlot Waste Management Facilities,
W72-09149 5G

SOIL CONSERVATION SERVICE, WASHINGTON, D.C.
Tallulah Creek Watershed (Long Creek Portion), North Carolina (Draft Environmental Impact Statement).
W72-09475 8A

Hitson, C and L and Washburn Draws, Watershed, Texas (Draft Environmental Impact Statements).
W72-09476 4B

SOUTH AFRICAN PULP AND PAPER INDUSTRIES, LTD., ENSTRA MILL.
The Use of Sewage Effluent at South African Pulp and Paper Industries' Enstra Bleached Kraft Mill,
W72-09399 5D

SOUTHEASTERN MASSACHUSETTS UNIV., NORTH DARTMOUTH. DEPT. OF BIOLOGY.
Uptake, Assimilation, and Loss of DDT Residues by Euphausia pacifica, A Euphausid Shrimp,
W72-09519 5C

SOUTHERN METHODIST UNIV., DALLAS, TEX. STATISTICS LAB.
On Bias Reduction in Estimation,
W72-09358 7C

SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
The Potential Contribution of Desalting to Future Water Supply in New Mexico,
W72-09306 3A

SPECTRAL IMAGING, INC., CONCORD, MASS.
Hadamard-Transform Spectrometry: A New Analytical Technique,
W72-09418 2K

STANDARD BRANDS CHEMICAL INDUSTRIES, INC., DOVER, DEL. (ASSIGNEE).
Flocculation of Particles Dispersed in Aqueous Media and Flocculants Used Therein,
W72-09505 5D

STANFORD UNIV., PACIFIC GROVE, CALIF. HOPKINS MARINE STATION.
DDT Residues in Salinas River Sediments,
W72-09313 5B

Effects of Petroleum Fractions on the Early Development of a Sea Urchin,
W72-09677 5C

STATE ELECTRICITY COMMISSION OF VICTORIA, (AUSTRALIA). HYDROLOGY, CIVIL AND ARCHITECTURAL DEPT.
Hazelwood Power Station - Data Collection and Analysis of Cooling Pond Performance,
W72-09737 5D

STATE UNIV. COLL., PLATTSBURGH, N.Y.
Ecology of the Epipelic Algal Communities in Marion Lake, British Columbia,
W72-09681 5C

STATE UNIV. OF NEW YORK, ALBANY.
Experimental Studies of Freezing, Wake Effect, and Breakup of Freely Suspended Supercooled Water Drops,
W72-09204 2B

Theory of Hail Growth,
W72-09205 2B

Estimation of the Occurrence of Hail and Hailstone Sizes,
W72-09206 2B

An Optical Lightning Detector,
W72-09208 2B

Large Vertical Wind Tunnel for Hydrometeor Studies,
W72-09210 2B

Design, Construction and Testing of the Dropsonde,
W72-09211 2B

Charging of Droplets by Impulse Corona,
W72-09212 2B

Field-Enhanced Propagation of Positive Streamers and Implications to Electrically Influenced Droplet Coalescence,
W72-09213 2B

Submicroscopic Aerosols from Electrically Stressed Water Surfaces,
W72-09214 2B

Miniature Whirlwinds Produced in the Laboratory by High-Voltage Electrical Discharges,
W72-09216 2B

Eyewitness Tornado Observations Obtained with Telephone and Tape Recorder,
W72-09217 2B

Point Discharge Current in Blackwell, Oklahoma, June 1969 - September 1970,
W72-09218 2B

STATE UNIV. OF NEW YORK, ALBANY. ATMOSPHERIC SCIENCES RESEARCH CENTER.
Experiments on the Generation of Raindrop-Size Distributions by Drop Breakup,
W72-09203 2B

Effect of Electric Field on Charge Separation by the Falling Precipitation Mechanism in Thunderclouds,
W72-09215 2B

Mountain-Peak Potential-Gradient Measurements and the Andes Glow,
W72-09219 2B

Airborne and Ground Measurements of the Atmospheric Potential Gradient During a Solar Eclipse,
W72-09220 2B

Considerations Regarding Solar and Lunar Modulation of Geophysical Parameters, Atmospheric Electricity and Thunderstorms,
W72-09221 2B

STATE UNIV. OF NEW YORK, ALBANY. DEPT. OF ATMOSPHERIC SCIENCES.
The Seeding of Ice Saturated Layers in the Atmosphere: A Computational Study,
W72-09207 2B

The Design, Construction, and Use of an Ice Crystal Counter for Ice Crystal Cloud Studies by Aircraft,
W72-09209 2B

STATE UNIV. OF NEW YORK, ALBANY. RESEARCH FOUNDATION.
Structure and Modification of Clouds and Fogs,
W72-09201 2B

STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF CHEMISTRY.
Selectivity of Cyclic Polyether Type Liquid Membrane Electrodes,
W72-09415 5A

STATE UNIV. OF NEW YORK, STONY BROOK. MARINE SCIENCES RESEARCH CENTER.
Polychlorinated Biphenyls and DDT Alter Species Composition in Mixed Cultures of Algae,
W72-09680 5C

STATE UNIV. OF NEW YORK, SYRACUSE. COLL. OF FORESTRY.
The Characteristics of Residues in Spent Chlorination Liquor,
W72-09592 5D

STOCKHOLM UNIV. (SWEDEN). INSTITUTIONEN FOR BIOKEMI.
Mutagenic Effect of TCDD On Bacteria Systems,
W72-09338 5C

STONE AND WEBSTER ENGINEERING CORP., BOSTON, MASS. (ASSIGNEE).
Evaporation-Reverse Osmosis Water Desalination System,
W72-09506 3A

SUN OIL CO., MARCUS HOOK, PA.
Simple Device for Introduction of Mass Calibrant into a Gas Chromatograph-Mass Spectrometer System,
W72-09323 2K

SYDNEY UNIV. (AUSTRALIA). DEPT. OF SOIL SCIENCE.
A Test of the Uniqueness of the Soil Moisture Characteristic During Transient, Nonhysteretic Flow of Water in a Rigid Soil,
W72-09183 2G

TEHRAN UNIV. (IRAN). DEPT. OF ENVIRONMENTAL HEALTH.
Investigation and Measurement of Radium in Ramsar Mineral Water,
W72-09266 5B

TELEDYNE ISOTOPES, PALO ALTO, CALIF. PALO ALTO LABS.
Infill of Nuclear Rubble Chimneys by Ground Water,
W72-09617 4B

TEXAS A AND M UNIV., COLLEGE STATION.
Soil Stabilization: A Mission Oriented Approach,
W72-09193 8D

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF CHEMISTRY.
Lanthanide Shift Reagents as an Aid in the NMR Analysis of the Normal Alcohols C6 to C11,
W72-09347 5A

TEXAS A AND M UNIV., COLLEGE STATION. INST. OF STATISTICS.
Introduction of Risk and Uncertainty Concepts to Optimization of Water Resources System Design,
W72-09290 6A

The Development of a Model to Evaluate Hydrologic Risk in a Water Resource System,
W72-09291 6A

The Development of a Model to Evaluate Hydrologic Risk in Water Resources System Design,
W72-09292 6A

A Comparison of Stochastic Linear Programming and Simulations for the Evaluation of Hydrologic Economic Risks in Water Resources System Design,
W72-09293 6A

The Effect of Risk Taking by Users of Irrigation Water,
W72-09294 6A

Risk Programming: An Aid in the Planning of a Reservoir - Irrigation System,
W72-09295 6A

TEXAS UNIV., AUSTIN. COLL. OF ENGINEERING.
Algal Influences on Dieoff Rates of Indicator Bacteria,
W72-09590 5D

TEXAS UNIV., AUSTIN. DEPT. OF ZOOLOGY.
Species and Individual Productivity in Phytoplankton Communities,
W72-09239 5C

THORODDSEN AND PARTNERS, REYKJAVIK (ICELAND).
Calculation of Frazil Ice Production,
W72-09629 2C

TOKYO UNIV. (JAPAN). FISHERIES INST.
Automatic Monitoring Method Using Biological Concentration for Marine Radioactive Contamination,
W72-09454 5A

TOKYO UNIV. OF EDUCATION (JAPAN). INST. FOR OPTICAL RESEARCH.
Gas-Solid Chromatography of Organic Compounds using Steam as the Carrier Gas,
W72-09566 5A

TSENTRALNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT KURORTOLOGII I FIZIOTERAPII, MOSCOW (USSR).
Nitrogen Thermal Waters of the USSR (Azotnyye termy SSSR),
W72-09645 2F

UKRAINIAN RESEARCH INST. OF THE FISH INDUSTRY, KIEV (USSR).
Causes of Number Variation in Replenishment of the Kakhovka Reservoir Carp School, (In Russian),
W72-09202 2H

UKRAINSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT FIZIOLOGII RASTENII, KIEV (USSR).
Daily Dynamics of Transpiration of Upper and Lower Sides of Leaves in Some Monocotyledonous and Dicotyledonous Plants, (In Ukrainian),
W72-09785 2D

UMEA UNIV., (SWEDEN). DEPT. OF ANALYTICAL CHEMISTRY.
Organic Radical-Ion Salts as Selective Electrochemical Sensors,
W72-09366 5A

UNION CARBIDE CORP., SOUTH CHARLESTON, W. VA. CHEMICALS AND PLASTICS.
Burner Memory Following Atomic Absorption Spectrophotometric Analysis of Moderately Volatile Organometallic Complexes,
W72-09247 5A

UNION CARBIDE CORP., TONAWANDA, N.Y. LINDE DIV.
Activated Sludge Processing.
W72-09389 5D

UNIVERSITY COLL., LONDON (ENGLAND).
Filtration of Water and Wastewater,
W72-09393 5D

UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.
The Seasonal Selection by Temperature of Heterotrophic Bacteria in an Intertidal Sediment,
W72-09350 5C

UNIVERSITY COLL. OF WALES, ABERYSTWYTH. DEPT. OF BIOCHEMISTRY; AND UNIVERSITY COLL. OF WALES, ABERYSTWYTH. DEPT. OF AGRICULTURAL BIOCHEMISTRY.
Effects of Organochlorine Insecticides on Bacterial Growth, Respiration and Viability,
W72-09361 5C

UNIVERSITY OF SOUTH FLORIDA, TAMPA. DEPT. OF BIOLOGY.
Animal-Sediment Relations and Community Analysis of a Florida Estuary,
W72-09177 5C

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. DEPT. OF CHEMISTRY.
The Role of the Diffuse Layer in Water-In-Oil Microemulsions,
W72-09335 5A

UNIVERSITY OF THE PANJAB, LAHORE (PAKISTAN). DEPT. OF BOTANY.
The Responses of Molinia Caerulea and Erica tetralix to Soil Aeration and Related Factors. III. Effects of Different Gas Concentrations on Growth in Solution Culture; and General Conclusions,
W72-09572 2I

UNIVERSITY OF THE SOUTH PACIFIC, SUVA (FIJI). SCHOOL OF NATURAL RESOURCES.
Influence of Soil Water Matric Potential and Hydraulic Conductivity on the Germination of Rape (Brassica napus L.),
W72-09780 3F

UNIVERSITY OF WESTERN ONTARIO, LONDON. DEPT. OF BIOPHYSICS.
Light-Induced Inhibition of Respiration in DCMU-Poisoned Chlorella by Photosystem I Activity,
W72-09178 5C

UNIVERSITY OF WESTERN ONTARIO, LONDON. DEPT. OF MATHEMATICS.
Best Linear Unbiased Estimates of the Parameters of the Logistic Distribution Based on Selected Order Statistics,
W72-09348 7C

UTAH STATE UNIV. FOUNDATION, LOGAN.
Extending the Utility of Non-Urban Water Supplies,
W72-09525 6B

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. ANAEROBE LAB.
Factors Involved in the Isolation of Clostridium Perfringens,
W72-09370 5A

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY AND VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. CENTER FOR ENVIRONMENTAL STUDIES.
The Effects of pH, Solubility and Temperature upon the Acute Toxicity of Zinc to the Bluegill Sunfish (Lepomis Macrochirus raf.),
W72-09679 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. WATER RESOURCES RESEARCH CENTER.
Water Resources Research in Virginia, Annual Report for Fiscal Year 1971.
W72-09199 9D

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT AGROLESOMELIORATSII, MOSCOW (USSR).
Moisture Content of Hummocky Sands Under Pine Plantings in the Middle Don Region (Vlazhnost'bugristykh peskov pod sosnovymi nasazhdeniyami na srednem Donu),
W72-09749 2G

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT GIGIENI I TOKSIKOLOGII PESTITSIDOV, KIEV (USSR).
Effects of Pesticides on the Life of a Water Body (K voprosu o vliyanii pestitsidov na zhizn' vodoyema),
W72-09651 5C

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT MINERALNOGO SYRYA, MOSCOW (USSR).
New Genetic Type of Tin Placers in the Northeastern Yakutsk ASSR (Novyy geneticheskiy tip olovonosnykh rossypey v Severo-Vostochnoy Yakutii),
W72-09283 2J

WARF INST., INC., MADISON, WIS.
Natural Carbon Sources, Rates of Replenishment, and Algal Growth,
W72-09168 5C

WASHINGTON, STATE UNIV., PULLMAN.
Long-Run Costs and Policy Implication of Adjusting to a Declining Water Supply in Eastern Washington,
W72-09148 4B

WASHINGTON STATE WATER RESEARCH CENTER, PULLMAN.
A Water Planning Concept for the State of Washington.
W72-09308 6D

WASHINGTON UNIV., SEATTLE. CENTER FOR QUANTITATIVE SCIENCE IN FORESTRY, FISHERIES AND WILDLIFE.
Ecological Dynamics of Watersheds,
W72-09565 2A

WASHINGTON UNIV., SEATTLE. COLL. OF FISHERIES; AND WASHINGTON UNIV., SEATTLE. LAB. OF RADIATION ECOLOGY.
Columbia River Studies, Annual Progress Report 1970-1971,
W72-09670 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Release of Dissolved Organic Matter from Natural Populations of Marine Phytoplankton,
W72-09363 5C

Voltammetric Measurement of Zinc in the Northeastern Tropical Pacific Ocean,
W72-09413 5A

WASHINGTON UNIV., SEATTLE. DEPT. OF ZOOLOGY.
Nutrients and Phytoplankton in Lake Washington,
W72-09167 5C

WASHINGTON UNIV., SEATTLE. INST. FOR FOOD SCIENCE AND TECHNOLOGY.
Effects of Incubation Temperature on the Salt Tolerance of Salmonella,
W72-09371 5C

WASHINGTON UNIV., SEATTLE. LAB. OF RADIATION ECOLOGY.
The Rate of Loss of Mercury by Pacific Oysters,
W72-09667 5A

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
The Determination of Nitrilotriacetic Acid (NTA) In Sewage and Sewage Effluent,
W72-09251 5A

WATER RESOURCES COUNCIL, WASHINGTON, D.C.
Coordination Directory for Planning Studies and Reports, August 1971.
W72-09273 6E

WATER RESOURCES ENGINEERS, INC., WALNUT CREEK, CALIF.
Mathematical Models for the Prediction of Thermal Energy Changes in Impoundments.
W72-09727 5B

WATERLOO UNIV. (ONTARIO). DEPT. OF CHEMISTRY.
GC/MS/Computers,
W72-09327 2K

WAYNE STATE UNIV., DETROIT, MICH. DEPT. OF BIOCHEMISTRY; AND WAYNE STATE UNIV., DETROIT, MICH. DEPT. OF PATHOLOGY; AND WAYNE STATE UNIV., DETROIT, MICH. DEPT. OF MICROBIOLOGY.
Determination of Copper, Iron, and Zinc From a Single Small Sample,
W72-09243 5A

WESTERN AUSTRALIA UNIV., NEDLANDS. DEPT. OF ZOOLOGY.
Interspecies Conflict in Estuarine Copepods,
W72-09231 2L

WESTERN FOREST PRODUCTS LAB., VANCOUVER (BRITISH COLUMBIA).
Methylation of Pentachlorophenol by Trichoderma Virgatum,
W72-09562 5B

WESTERN MICHIGAN UNIV., KALAMAZOO, DEPT. OF BIOLOGY.
The Relationships Between 32P Accumulation in Algae, Bacteria and Tubificids,
W72-09668 5C

WESTINGHOUSE ELECTRIC CORP., EAST PITTSBURGH, PA.
Comparison of Evaporative Losses in Various Condenser Cooling Water Systems,
W72-09735 2D

WICHITA STATE UNIV., KANS. DEPT. OF ECONOMICS.
Cost of Waste Treatment in the Meat Packing Industry,
W72-09397 5D

WISCONSIN UNIV., MADISON. MCARDLE MEMORIAL LAB.
Simple Device for Transferring and Eluting Thin-Layer Chromatographic Fractions,
W72-09342 2K

WISCONSIN UNIV., MADISON. WATER CHEMISTRY PROGRAM.
Adsorption of Lindane and Dieldrin Pesticides on Unconsolidated Aquifer Sands,
W72-09539 5B

WISCONSIN UNIV., MADISON. WATER RESOURCES CENTER.
Wastewater Treatment and Eutrophication,
W72-09170 5C

Distributional Ecology and Behavioral Thermoregulation of Fishes in Relation to Heated Effluent from a Steam-Electric Power Plant (Lake Monona, Wisconsin),
W72-09236 5C

Asymptotic Theory of Helical Waves on a Gaseous Jet in a Rotating Viscous Fluid,
W72-09237 2E

Effects of South Shore Drainage Basins and Clay Erosion on the Physical and Chemical Limnology of Western Lake Superior,
W72-09238 2H

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Controlled Eutrophication-Increasing Food Production from the Sea by Recycling Human Wastes,
W72-09378 5G

Trace Element Concentrations in Some Modern Corals,
W72-09577 5A

WUERZBURG UNIV. (WEST GERMANY). BOTANISCHES INSTITUT II.
Responses of Stomata to Changes in Humidity,
W72-09783 2D

YOUNGSTOWN SHEET AND TUBE CO., EAST CHICAGO, IND.
The Operation of Pressure Type Sand Filters for Hot Mill Waste Waters,
W72-09587 5D

ZAGREB UNIV. (YUGOSLAVIA). CENTER FOR MARINE RESEARCH.
Polarography of Seawater II. Complex Formation of Cadmium with EDTA,
W72-09673 5A

ACCESSION NUMBER INDEX

W72-09139 6A
W72-09140 5D
W72-09141 5C
W72-09142 6C
W72-09143 6A
W72-09144 6E
W72-09145 6C
W72-09146 3B
W72-09147 6G
W72-09148 4B
W72-09149 5G
W72-09150 5G
W72-09151 5B
W72-09152 5A
W72-09153 5G
W72-09154 5C
W72-09155 5C
W72-09156 5C
W72-09157 5C
W72-09158 5C
W72-09159 5C
W72-09160 5C
W72-09161 5C
W72-09162 5C
W72-09163 5C
W72-09164 5C
W72-09165 5C
W72-09166 5C
W72-09167 5C
W72-09168 5C
W72-09169 5C
W72-09170 5C
W72-09171 5C
W72-09172 5C
W72-09173 5C
W72-09174 5D
W72-09175 5C
W72-09176 5C
W72-09177 5C
W72-09178 5C
W72-09179 5C
W72-09180 5C
W72-09181 5C
W72-09182 5A
W72-09183 2G
W72-09184 5C
W72-09185 2L
W72-09186 8C
W72-09187 8C
W72-09188 5G
W72-09189 3B
W72-09190 8F
W72-09191 8D
W72-09192 8C
W72-09193 8D
W72-09194 8B
W72-09195 3F
W72-09196 5G
W72-09197 8A
W72-09198 8A
W72-09199 9D
W72-09200 9D
W72-09201 2B
W72-09202 2H
W72-09203 2B
W72-09204 2B
W72-09205 2B
W72-09206 2B
W72-09207 2B
W72-09208 2B
W72-09209 2B
W72-09210 2B
W72-09211 2B
W72-09212 2B
W72-09213 2B
W72-09214 2B
W72-09215 2B
W72-09216 2B
W72-09217 2B
W72-09218 2B
W72-09219 2B
W72-09220 2B
W72-09221 2B
W72-09222 2E
W72-09223 2G
W72-09224 2E
W72-09225 7C
W72-09226 7C
W72-09227 7C
W72-09228 6A
W72-09229 5G
W72-09230 6G
W72-09231 2L
W72-09232 5B
W72-09233 5D
W72-09234 6A
W72-09235 5G
W72-09236 5C
W72-09237 2E
W72-09238 2H
W72-09239 5C
W72-09240 5B
W72-09241 5A
W72-09242 5A
W72-09243 5A
W72-09244 5C
W72-09245 5A
W72-09246 5A
W72-09247 5A
W72-09248 5C
W72-09249 5A
W72-09250 5B
W72-09251 5A
W72-09252 4A
W72-09253 5A
W72-09254 5A
W72-09255 2C
W72-09256 2J
W72-09257 2E
W72-09258 5G
W72-09259 4A
W72-09260 2J
W72-09261 7A
W72-09262 7A
W72-09263 7C
W72-09264 4B
W72-09265 3B
W72-09266 5B
W72-09267 4B
W72-09268 4A
W72-09269 2F
W72-09270 4A
W72-09271 2A
W72-09272 2B
W72-09273 6E
W72-09274 8B
W72-09275 3B
W72-09276 2F
W72-09277 2F
W72-09278 7B
W72-09279 2C
W72-09280 2L
W72-09281 2J
W72-09282 2L
W72-09283 2J
W72-09284 2J
W72-09285 2J
W72-09286 2L
W72-09287 4A
W72-09288 4A
W72-09289 5F
W72-09290 6A
W72-09291 6A
W72-09292 6A
W72-09293 6A
W72-09294 6A
W72-09295 6A
W72-09296 2A
W72-09297 4B
W72-09298 2H
W72-09299 2G
W72-09300 6D
W72-09301 5D
W72-09302 5D
W72-09303 6D
W72-09304 5G
W72-09305 2B
W72-09306 3A
W72-09307 2I
W72-09308 6D
W72-09309 6D
W72-09310 7C
W72-09311 7C
W72-09312 5A
W72-09313 5B
W72-09314 5A
W72-09315 5A
W72-09316 5A
W72-09317 5A
W72-09318 5C
W72-09319 5A
W72-09320 5C
W72-09321 5B
W72-09322 5A
W72-09323 2K
W72-09324 2K
W72-09325 2K
W72-09326 5A
W72-09327 2K
W72-09328 5A
W72-09329 5A
W72-09330 5A
W72-09331 5A
W72-09332 5A
W72-09333 2I
W72-09334 2L
W72-09335 5A
W72-09336 5B
W72-09337 5A
W72-09338 5C
W72-09339 7B
W72-09340 5C
W72-09341 5C
W72-09342 2K
W72-09343 5A
W72-09344 5B
W72-09345 5B
W72-09346 5A
W72-09347 5A
W72-09348 7C
W72-09349 5C
W72-09350 5C
W72-09351 5B
W72-09352 5A
W72-09353 5A
W72-09354 5A
W72-09355 5A
W72-09356 5C
W72-09357 7C
W72-09358 7C
W72-09359 5C
W72-09360 2L
W72-09361 5C
W72-09362 5C
W72-09363 5C
W72-09364 5C
W72-09365 5A
W72-09366 5A
W72-09367 5A
W72-09368 5A
W72-09369 5A
W72-09370 5A
W72-09371 5C
W72-09372 7B
W72-09373 5A
W72-09374 5A
W72-09375 5A
W72-09376 5A
W72-09377 5B
W72-09378 5G
W72-09379 5A
W72-09380 8A
W72-09381 5D
W72-09382 5D
W72-09383 5D
W72-09384 5D
W72-09385 5D
W72-09386 5D
W72-09387 5F
W72-09388 5D
W72-09389 5D
W72-09390 5D
W72-09391 5D
W72-09392 5F
W72-09393 5D
W72-09394 2K
W72-09395 5D
W72-09396 5D
W72-09397 5D
W72-09398 5D
W72-09399 5D
W72-09400 5D
W72-09401 5D
W72-09402 5C
W72-09403 5A
W72-09404 5A
W72-09405 5A
W72-09406 5C
W72-09407 5C
W72-09408 5A
W72-09409 5B
W72-09410 5A
W72-09411 5A
W72-09412 5C
W72-09413 5A
W72-09414 2I
W72-09415 5A
W72-09416 7B
W72-09417 5C
W72-09418 2K
W72-09419 5A
W72-09420 5B
W72-09421 5A
W72-09422 5A
W72-09423 5A
W72-09424 5G
W72-09425 5A
W72-09426 6B
W72-09427 5G
W72-09428 5B
W72-09429 5A
W72-09430 8A
W72-09431 8A
W72-09432 8A
W72-09433 8A
W72-09434 8A
W72-09435 8A
W72-09436 8A
W72-09437 5A
W72-09438 5A
W72-09439 5A
W72-09440 5A
W72-09441 5A
W72-09442 5A
W72-09443 5A
W72-09444 5A
W72-09445 5A
W72-09446 5A
W72-09447 5A
W72-09448 5A
W72-09449 5A
W72-09450 5A

W72-09451 5A
W72-09452 5A
W72-09453 5A
W72-09454 5A
W72-09455 5A
W72-09456 5A
W72-09457 5A
W72-09458 2H
W72-09459 5G
W72-09460 6E
W72-09461 5G
W72-09462 8D
W72-09463 4A
W72-09464 8D
W72-09465 6E
W72-09466 5G
W72-09467 5G
W72-09468 4A
W72-09469 6E
W72-09470 6E
W72-09471 6E
W72-09472 6E
W72-09473 8C
W72-09474 8A
W72-09475 8A
W72-09476 4B
W72-09477 4A
W72-09478 8D
W72-09479 6E
W72-09480 8D
W72-09481 8D
W72-09482 4A
W72-09483 4A
W72-09484 6E
W72-09485 6E
W72-09486 6E
W72-09487 3A
W72-09488 5D
W72-09489 5D
W72-09490 5G
W72-09491 2K
W72-09492 5D
W72-09493 5D
W72-09494 5G
W72-09495 5G
W72-09496 5D
W72-09497 5D
W72-09498 5G
W72-09499 5G
W72-09500 5D
W72-09501 5G
W72-09502 5D
W72-09503 5G
W72-09504 4A
W72-09505 5D
W72-09506 3A
W72-09507 5G
W72-09508 5G
W72-09509 5G
W72-09510 5G
W72-09511 4A
W72-09512 5G
W72-09513 3A
W72-09514 3A
W72-09515 2E
W72-09516 3A
W72-09517 3A
W72-09518 3A
W72-09519 5C
W72-09520 5C
W72-09521 7C
W72-09522 6B
W72-09523 2I
W72-09524 5B
W72-09525 6B
W72-09526 6D
W72-09527 5G
W72-09528 5A
W72-09529 6G
W72-09530 5B
W72-09531 5C
W72-09532 5B
W72-09533 5B
W72-09534 7C
W72-09535 7C
W72-09536 7C
W72-09537 1B
W72-09538 6E
W72-09539 5B
W72-09540 2J
W72-09541 8B
W72-09542 2J
W72-09543 2F
W72-09544 2K
W72-09545 5A
W72-09546 2J
W72-09547 5B
W72-09548 5B
W72-09549 5B
W72-09550 5B
W72-09551 5B
W72-09552 5C
W72-09553 5C
W72-09554 5C
W72-09555 2H
W72-09556 2E
W72-09557 7C
W72-09558 4B
W72-09559 4B
W72-09560 6G
W72-09561 5A
W72-09562 5B
W72-09563 5A
W72-09564 5A
W72-09565 2A
W72-09566 5A
W72-09567 5C
W72-09568 5C
W72-09569 5C
W72-09570 5C
W72-09571 5A
W72-09572 2I
W72-09573 2L
W72-09574 5B
W72-09575 5C
W72-09576 2I
W72-09577 5A
W72-09578 3F
W72-09579 5C
W72-09580 5D
W72-09581 5D
W72-09582 5D
W72-09583 5D
W72-09584 5D
W72-09585 5D
W72-09586 5D
W72-09587 5D
W72-09588 5D
W72-09589 5D
W72-09590 5D
W72-09591 5D
W72-09592 5D
W72-09593 5D
W72-09594 5D
W72-09595 5D
W72-09596 5D
W72-09597 5D
W72-09598 5D
W72-09599 5D
W72-09600 5D
W72-09601 5D
W72-09602 5D
W72-09603 3B
W72-09604 3B
W72-09605 2K
W72-09606 2I
W72-09607 2C
W72-09608 2D
W72-09609 2I
W72-09610 2D
W72-09611 2C
W72-09612 2C
W72-09613 2C
W72-09614 2J
W72-09615 8B
W72-09616 5B
W72-09617 4B
W72-09618 2F
W72-09619 2F
W72-09620 5B
W72-09621 4B
W72-09622 2C
W72-09623 2C
W72-09624 2C
W72-09625 2C
W72-09626 2C
W72-09627 2C
W72-09628 2C
W72-09629 2C
W72-09630 2C
W72-09631 2C
W72-09632 2C
W72-09633 2C
W72-09634 2C
W72-09635 2C
W72-09636 2C
W72-09637 2C
W72-09638 2C
W72-09639 2C
W72-09640 2C
W72-09641 2C
W72-09642 2C
W72-09643 2K
W72-09644 8B
W72-09645 2F
W72-09646 5C
W72-09647 5C
W72-09648 5C
W72-09649 5C
W72-09650 5C
W72-09651 5C
W72-09652 5C
W72-09653 5C
W72-09654 5D
W72-09655 5C
W72-09656 4D
W72-09657 5B
W72-09658 3F
W72-09659 3F
W72-09660 3F
W72-09661 3F
W72-09662 3F
W72-09663 3F
W72-09664 3F
W72-09665 3F
W72-09666 5C
W72-09667 5A
W72-09668 5C
W72-09669 5G
W72-09670 5C
W72-09671 5F
W72-09672 5A
W72-09673 5A
W72-09674 2L
W72-09675 5C
W72-09676 5B
W72-09677 5C
W72-09678 5C
W72-09679 5C
W72-09680 5C
W72-09681 5C
W72-09682 5B
W72-09683 5C
W72-09684 5A
W72-09685 5C
W72-09686 5C
W72-09687 5F
W72-09688 5D
W72-09689 5F
W72-09690 5F
W72-09691 5F
W72-09692 5F
W72-09693 5F
W72-09694 5F
W72-09695 5F
W72-09696 5F
W72-09697 4A
W72-09698 8B
W72-09699 8C
W72-09700 8D
W72-09701 6B
W72-09702 8F
W72-09703 8C
W72-09704 8D
W72-09705 4A
W72-09706 8D
W72-09707 4A
W72-09708 2L
W72-09709 8F
W72-09710 8C
W72-09711 5A
W72-09712 8F
W72-09713 8F
W72-09714 5C
W72-09715 5B
W72-09716 5C
W72-09717 5C
W72-09718 5A
W72-09719 5B
W72-09720 5B
W72-09721 5C
W72-09722 8I
W72-09723 5C
W72-09724 2I
W72-09725 5C
W72-09726 5D
W72-09727 5B
W72-09728 5B
W72-09729 5B
W72-09730 2H
W72-09731 5B
W72-09732 5B
W72-09733 5B
W72-09734 5C
W72-09735 2D
W72-09736 2D
W72-09737 5D
W72-09738 5D
W72-09739 5D
W72-09740 5D
W72-09741 5D
W72-09742 2G
W72-09743 3F
W72-09744 2G
W72-09745 2B
W72-09746 2B
W72-09747 2B
W72-09748 2G
W72-09749 2G
W72-09750 4B
W72-09751 3F
W72-09752 3F
W72-09753 3F
W72-09754 2F
W72-09755 2E
W72-09756 4B
W72-09757 7C
W72-09758 7B
W72-09759 2J
W72-09760 2E
W72-09761 8B
W72-09762 8B
W72-09763 2L
W72-09764 7C
W72-09765 7C
W72-09766 7C

W72-09767 7C
W72-09768 7C
W72-09769 2F
W72-09770 7C
W72-09771 7C
W72-09772 3F
W72-09773 2I
W72-09774 2G
W72-09775 2D
W72-09776 3F
W72-09777 5A
W72-09778 2H
W72-09779 5C
W72-09780 3F
W72-09781 6D
W72-09782 2I
W72-09783 2D
W72-09784 2L
W72-09785 2D
W72-09786 2I
W72-09787 5G
W72-09788 6A

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. Centers of Competence		
University of Wisconsin, Water Resources Economics	W72-09139 -- 09140 09142 -- 09148	9
Iowa State University, Agricultural Livestock Wastes	W72-09149 -- 09153	5
University of Wisconsin, Eutrophication	W72-09154 -- 09173 09176 -- 09181	26
Vanderbilt University, Thermal Pollution	W72-09723 09725 -- 09729 09731 -- 09741	17
AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W72-09420 -- 09457 09528 -- 09533	44
University of Florida, Eastern U. S. Water Law	W72-09459 -- 09486	28
University of Washington, Water Quality Requirements for Aquatic Organisms	W72-09519 -- 09522 09524, 09554 09677 -- 09680 09682 -- 09686 09714 -- 09722	24
U. S. Geological Survey, Hydrology	W72-09201 09203 -- 09227 09255 -- 09285 09299, 09380 09534 -- 09553 09555 -- 09560 09614 -- 09652 09742 -- 09751 09754 -- 09771	152
Cornell University, Policy Models for Water Resources Systems	W72-09228 -- 09230 09232 -- 09235 09287 09289 -- 09295	15
American Water Works Association Research Foundation, Public Water Supply Treatment Technology	W72-09687 -- 09696	10
Bureau of Reclamation, Engineering Works	W72-09186 -- 09198 09697 -- 09706 09709 -- 09710 09712 -- 09713	27
Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W72-09239 -- 09251 09253 -- 09254 09310 -- 09332 09334 -- 09359 09361 -- 09379 09402 -- 09413 09415 -- 09419 09561 -- 09566 09568 -- 09571 09573 -- 09575 09577, 09579 09666 -- 09676	126
University of Texas, Wastewater Treatment and Management	W72-09381 -- 09393 09395 -- 09401 09580 -- 09602	43

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
B. State Water Resources Research Institutes		
Virginia Water Resources Research Center	W72-09199	1
Rhode Island Water Resources Center	W72-09200	1
Wisconsin Water Resources Center	W72-09236 -- 09238	3
Ohio Water Resources Center	W72-09296	1
North Carolina Water Resources Research Institute	W72-09297 09655 -- 09657	4
Illinois Water Resources Center	W72-09298	1
Massachusetts Water Resources Research Center	W72-09653	1
Pennsylvania Institute for Research on Land and Water Resources	W72-09654	1
New Mexico Water Resources Research Institute	W72-09658 -- 09665	8
C. Other		
BioSciences Information Service	W72-09141 09174 -- 09175 09182 -- 09185 09202, 09231 09252, 09286 09288, 09307 09333, 09360 09394, 09414 09458, 09498 09515, 09523 09567, 09572 09576, 09578 09681 09707 -- 09708 09711, 09724 09730 09752 -- 09753 09772 -- 09786	48
Engineering Aspects of Urban Water Resources (Poertner)	W72-09300 -- 09306 09308 -- 09309	9
Ocean Engineering Information Service	W72-09487 -- 09497 09499 -- 09512	25
Office of Saline Water	W72-09513 -- 09514 09516 -- 09518	5
National Water Commission	W72-09525 -- 09527	3
Forest Service	W72-09603 -- 09613	11
Office of Water Resources Research	W72-09787 -- 09788	2

☆ U. S. GOVERNMENT PRINTING OFFICE : 1972 O - 511-643 (2)

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
211

AN EQUAL OPPORTUNITY EMPLOYER

SHRA
X721231
PACIFIC POWER AND LIGHT CO
M L HUTCHINSON LIBRARIAN
PUBLIC SERVICE BLDG
PORTLAND OR 97204

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
Springfield, Va. 22151

OFFICIAL BUSINESS

PRINTED MATTER

LIBRARY
OCT 19 1972
PACIFIC POWER & LIGHT COMPANY